

Operator's Manual

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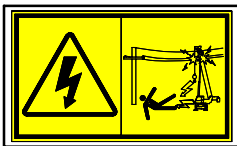
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Safety, Information, And Instruction Labels

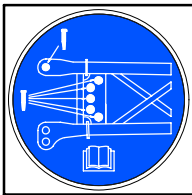
Safety, information, and instruction labels are on the crane to alert the operator and ground personnel to important and critical instructions. These labels should be periodically inspected and cleaned as necessary to maintain good legibility for safe viewing. If any labels become lost, damaged, or unreadable, they must be replaced. Information contained on such labels is important and failure to follow the information they contain could result in an accident. The following along with Figure 1–1, illustrates the location and gives a definition of each label on the crane.

1. Electric Power Line Hazard Label



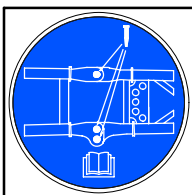
This label signifies an electric power line hazard. Keep all personnel away from crane if close to power lines. Crane, load, and ground can become electrified and deadly. Refer to “Electrical Dangers” in this Operator’s Manual for additional information.

2. Fly Tip Connecting Pin Storage Label (If Equipped)



This label signifies fly tip connecting pin storage locations. All fly connecting pins must be stored in the proper location when fly is stored on the boom. Refer to “Offset Lattice Fly” in this Operator’s Manual for additional information.

3. Fly Tip Connecting Pin Installation Label (If Equipped)



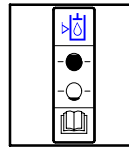
This label signifies the fly tip connecting pin installation location. All fly connecting pins must be installed in the proper location when erecting the fly. Refer to “Offset Lattice Fly” in this Operator’s Manual for additional information.

4. Falling Fly Hazard Label (If Equipped)



This label signifies a falling fly hazard. Properly support the fly before removing connecting pins. Refer to “Offset Lattice Fly” in this Operator’s Manual for additional information.

5. Hydraulic Oil Level Label



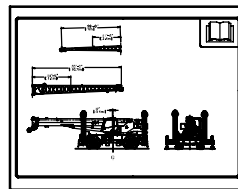
This label signifies the proper oil level in the hydraulic reservoir. Refer to “Hydraulic Reservoir” in this Operator’s Manual for additional information.

6. ASME B30.5 Certification Label



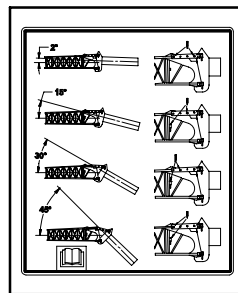
This label signifies that the crane is ASME B30.5 certified.

7. Crane Lifting Label



This label outlines the crane and crane component weights and centers of gravity to assist personnel when transporting the crane. Refer to “Lifting The Crane” in this Operator’s Manual for additional information.

8. Fly Offset Connecting Pin Location Label (If Equipped)



This label signifies the proper location of the fly offset connecting pins. Refer to “Offset Lattice Fly” in this Operator’s Manual for additional information.

9. Body Crush Hazard Label



This label signifies a body crushing hazard from moving parts. Keep clear of moving parts.

10. Foot Crush Hazard Label



This label signifies a foot crushing hazard from moving parts. Keep clear of moving parts.

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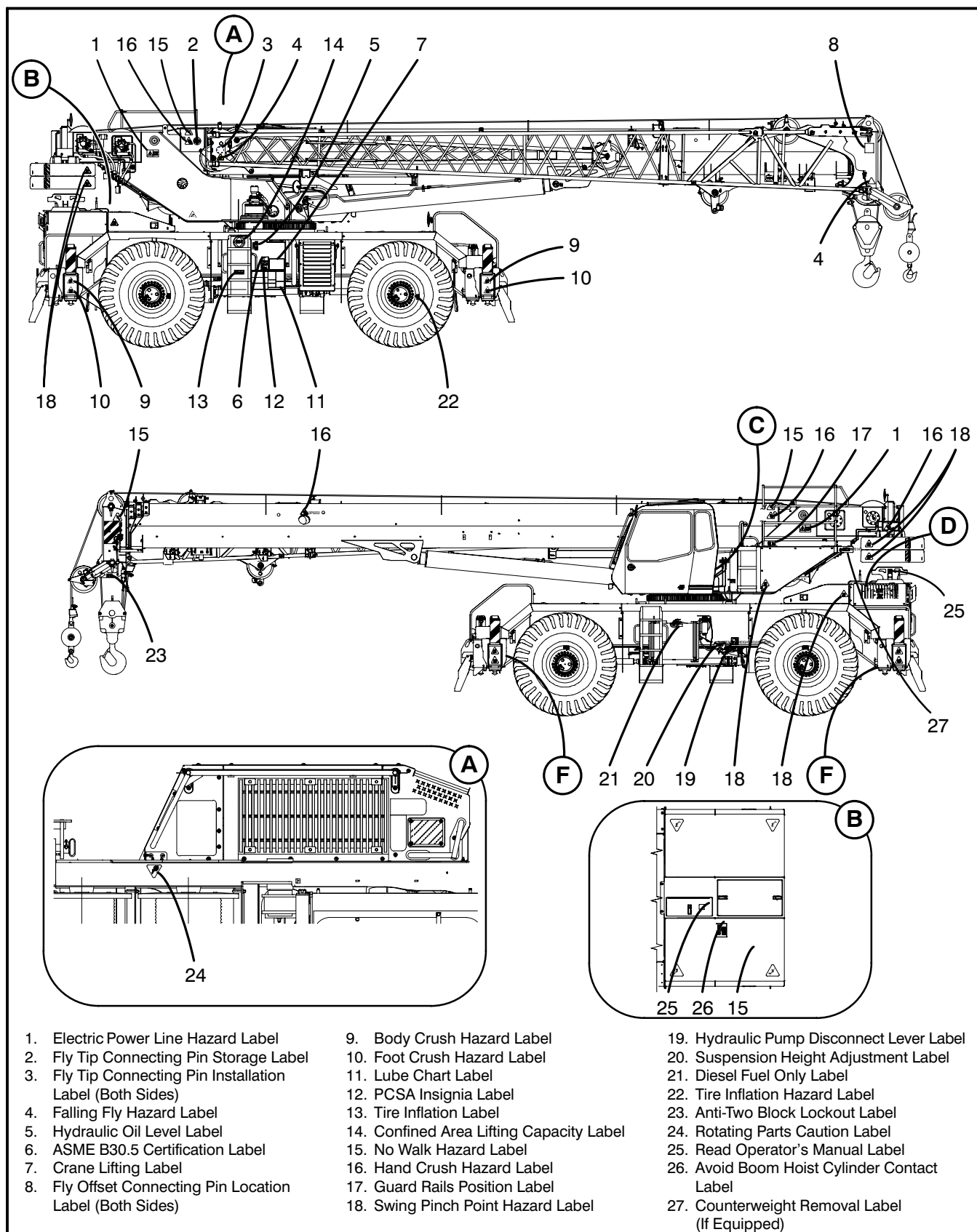
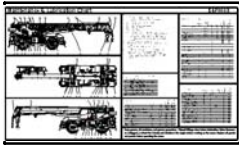


Figure 1-1
Label Locations

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11. Lube Chart Label



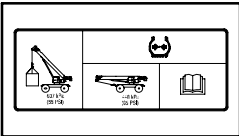
This label signifies the location of the maintenance and lubrication points on the crane. Refer to “General Lubrication Information” in this Operator's Manual for additional information.

12. PCSA Insignia Label



This label signifies that the crane complies with the applicable requirements of PCSA Standard No.4.

13. Tire Inflation Label



This label signifies the correct tire pressures during the working and travel positions.

14. Confined Area Lifting Capacity Label



This label signifies that the crane has capacities for multiple outrigger positions. Refer to “Main Outrigger Operation” in this Operator's Manual for additional information.

15. No Walk Hazard Label



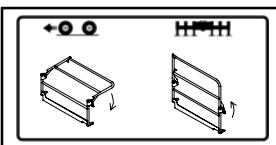
This label signifies a non-walking surface/fall hazard. Do not walk on this surface.

16. Hand Crush Hazard Label



This label signifies a hand crushing hazard from moving parts. Keep clear of moving parts.

17. Guard Rails Position Label



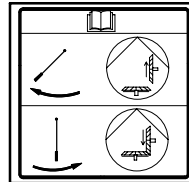
This label defines the positions of the guard rails. Refer to “Upper Guard Rails” in this Operator's Manual for additional information.

18. Swing Pinch Point Hazard Label



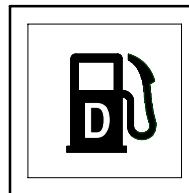
This label signifies a pinch point hazard from the swinging upper. Keep clear of swinging upper.

19. Hydraulic Pump Disconnect Instruction Label (If Equipped)



This label defines the hydraulic pump disconnect control handle positions. Refer to “Hydraulic Pump Disconnect” in this Operator's Manual for additional information.

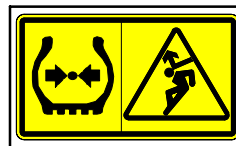
21. Diesel Fuel Only Label



This label, when located on the crane fuel tank, signifies that the crane engine uses diesel fuel only. Refer to the engine manufacturer's manual for additional information.

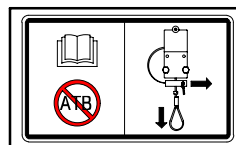
This label, when located on the cab heater fuel tank, signifies that the cab heater uses diesel fuel only.

22. Tire Inflation Hazard Label



This label signifies a tire inflation hazard. Do not stand in front of a tire when inflating it. Refer to “Tire Inflation” in this Operator's Manual for additional information.

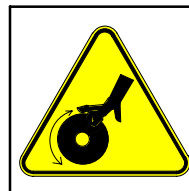
23. Anti-Two Block Lockout Label



This label signifies that the main boom anti-two block switch is disabled when lockout pin is installed in the hole. Refer to “Lockout Pin

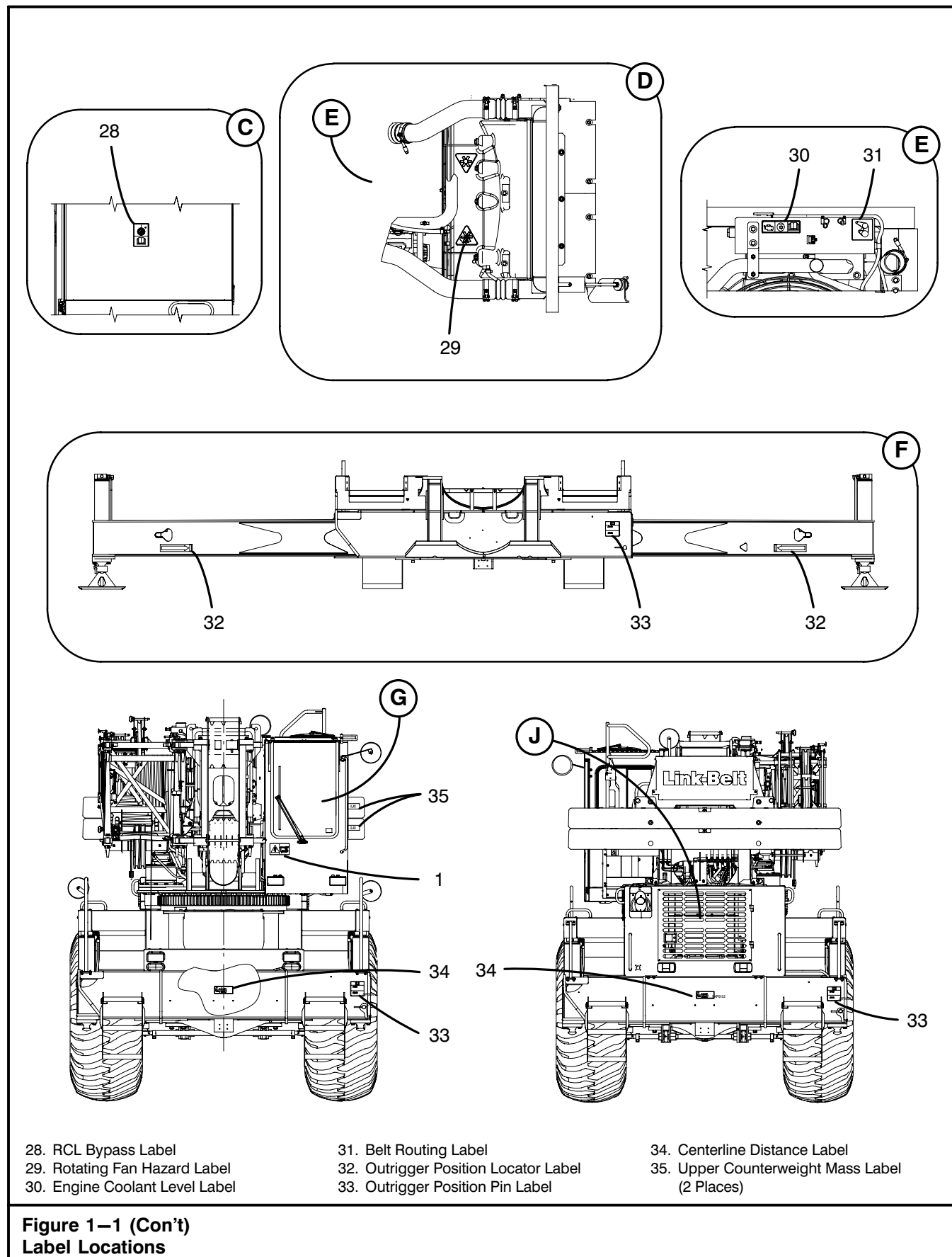
And Flag” in this Operator's Manual for additional information.

24. Rotating Parts Caution Label



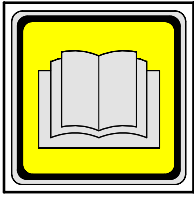
This label signifies a rotating part hazard. Keep clear of rotating parts.

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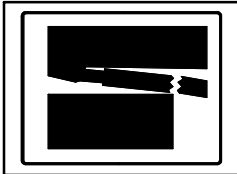
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25. Read Operator's Manual Label



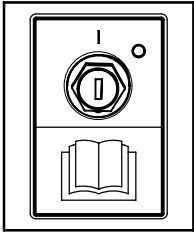
This label signifies to refer to the engine manufacturer's manual and/or this Operator's Manual for additional information.

26. Avoid Boom Hoist Cylinder Contact Label



This label signifies a boom hoist cylinder contact point. Use caution when swinging over the rear at low boom angles and lowering the boom when over the rear of the carrier to prevent the boom hoist cylinder from damaging the hood.

28. RCL Bypass Label



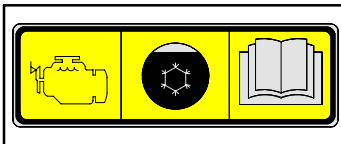
This label defines the key positions for the RCL bypass system. Refer to "System Bypass" in this Operator's Manual for additional information.

29. Rotating Fan Hazard Label



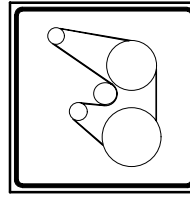
This label signifies a rotating fan hazard. Keep clear of rotating fan.

30. Engine Coolant Level Label



This label signifies the proper coolant level in the surge tank. Refer to the engine manufacturer's manual and "Engine Cooling System" in this Operator's Manual for additional information.

31. Belt Routing Label



This label displays the orientation and routing of the engine belt.

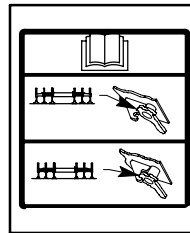
32. Outrigger Position Locator Label



This label signifies when the outrigger beam has reached its selected position.

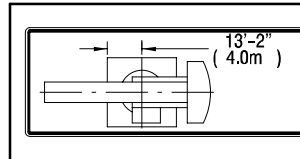
Refer to "Outrigger Operation" in this Operator's Manual for additional information.

33. Outrigger Position Lever Label



This label defines the location of the outrigger position lever to obtain the desired beam extension. Refer to "Outrigger Operation" in this Operator's Manual for additional information.

34. Centerline Distance Label



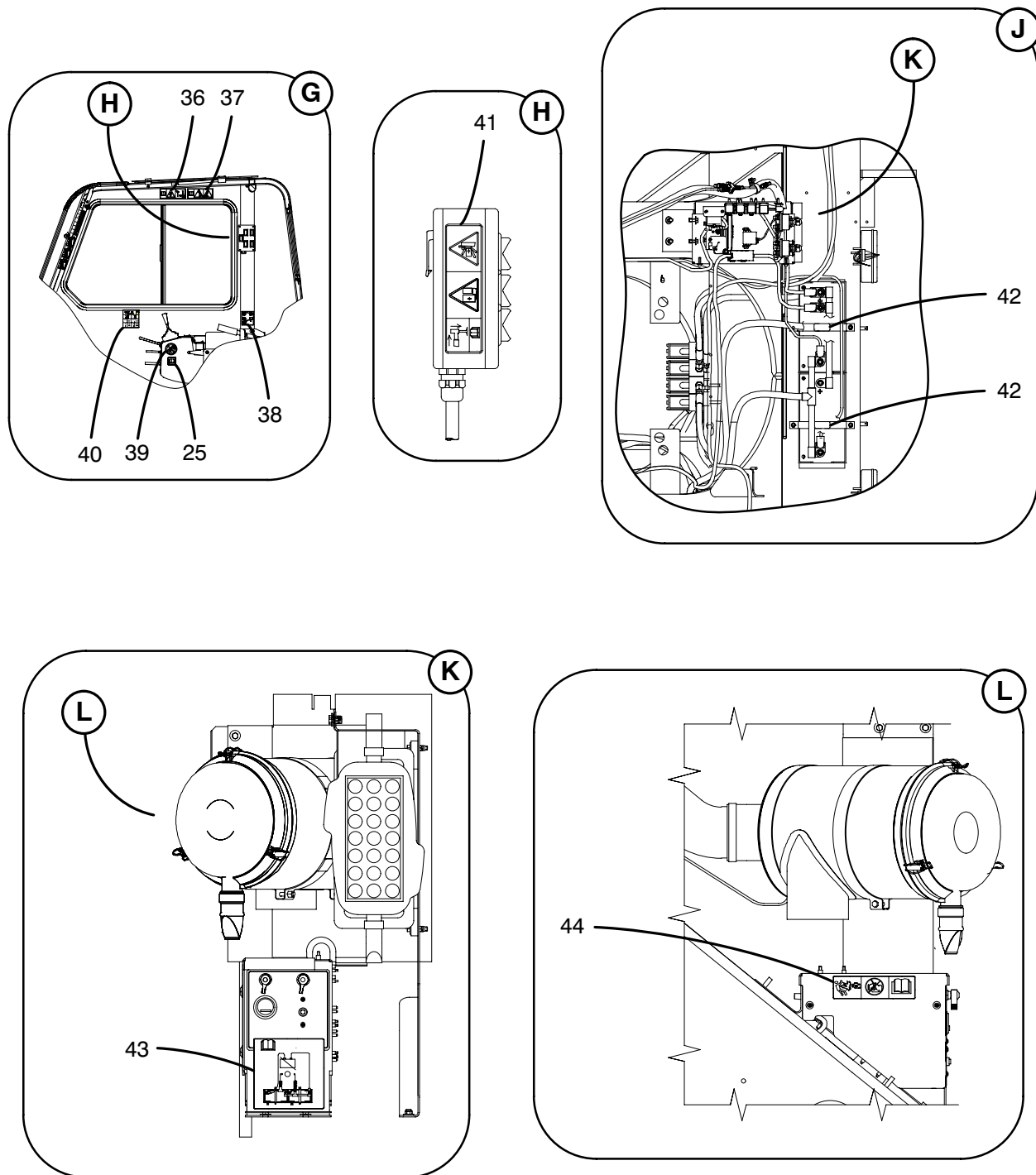
This label identifies the distance from the bumper to the centerline of rotation of the crane.

35. Upper Counterweight Mass Label



This label signifies the approximate weight of the counterweight. Refer to this Operator's Manual for additional information.

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36. Electric Power Line Hazard Label
 37. Crane Stability Hazard Label
 38. Travel Swing Lock Instruction Label

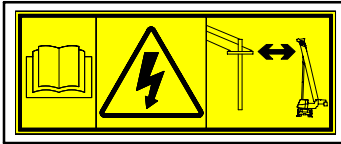
39. No Access Label
 40. Travel Speed Caution Label
 41. Outrigger Operational Hazard Label

42. 12 Volt Label
 43. Battery Cable Schematic Label
 44. Engine Starting Fluid Hazard Label

Figure 1-1 (Con't)
Label Locations

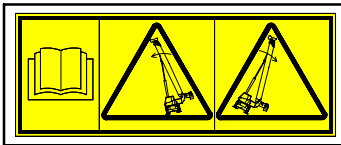
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36. Electric Power Line Hazard Label



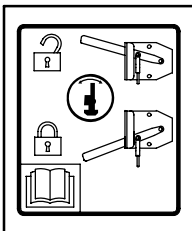
This label signifies to keep all parts of the crane away from electrical power lines. Refer to “Electrical Dangers” in this Operator’s Manual for additional information.

37. Crane Stability Hazard Label



This label signifies a stability hazard at certain boom angles with the upper over the side. Refer to this Operator’s Manual for additional information.

38. Travel Swing Lock Instruction Label



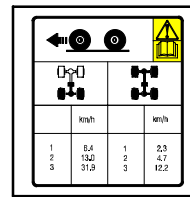
This label defines the swing lock control handle positions. Refer to “Travel Swing Lock” in this Operator’s Manual for additional information.

39. No Access Label



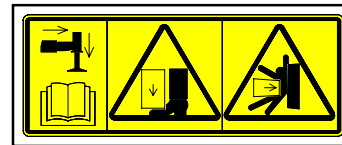
This label signifies not to enter or exit the operator’s cab with the left console in the down position. Ensure the left side console is rotated up, out of the way before attempting to enter or exit the upper cab.

40. Travel Speed Caution Label



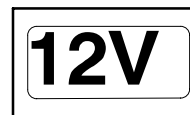
This label signifies the maximum speed to travel the crane. Refer to “Highway Travel” in this Operator’s Manual for additional information.

41. Outrigger Operational Hazard Label



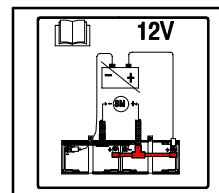
This label signifies an outrigger operational hazard. Keep clear of moving parts. Refer to this Operator’s Manual for additional information.

42. 12 Volt Label



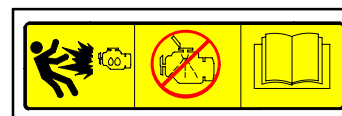
This label identifies that the crane’s electrical system is 12 volts.

43. Battery Cable Schematic Label



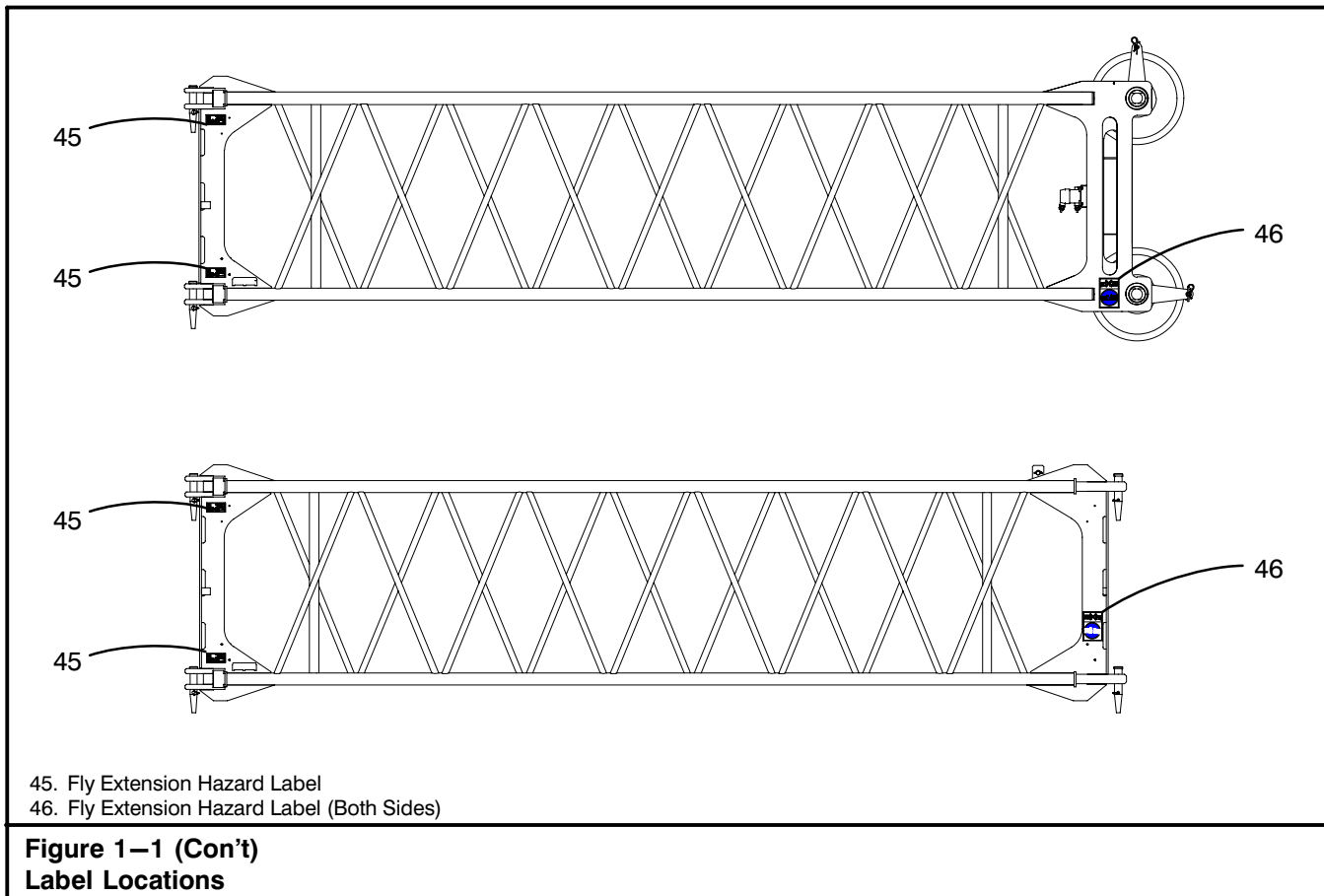
This label defines the battery cable connections. Refer to “Jump Starting The Crane” in this Operator’s Manual for additional information.

44. Engine Starting Fluid Hazard Label

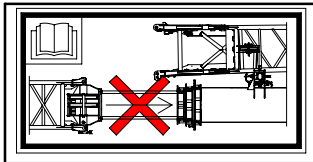


This label signifies an engine starting fluid usage hazard. This engine is equipped with glow plugs and use of a starting fluid can cause an explosion resulting in serious personal injury or death. Refer to “Glow Plugs” in this Operator’s Manual for additional information.

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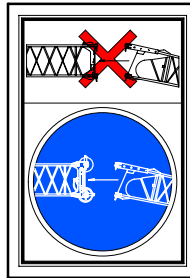


45. Fly Extension Hazard Label (If Equipped)

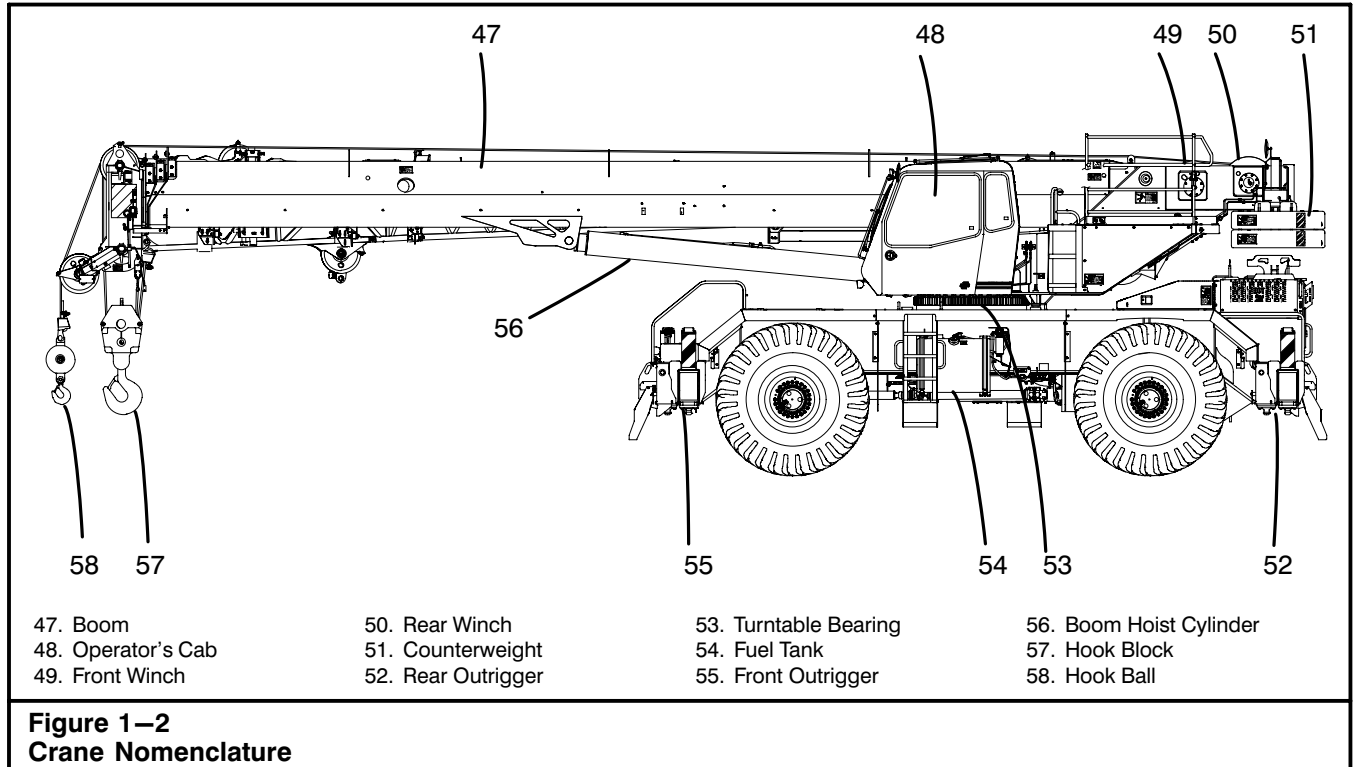


This label signifies a hazard when retracting the boom with the fly extension installed. Do not fully retract the boom when the fly extension is installed and the off-set fly is in the stored position on the boom. Crane damage may occur. Refer to "Fly Extensions" in this Operator's Manual for additional information.

46. Fly Extension Hazard Label (If Equipped)



This label signifies a fly extension installation hazard. Do not install the fly base to the extension without sheaves. Always install the fly base to the extension equipped with lifting sheaves. Refer to "Fly Extensions" in this Operator's Manual for additional information.



On Delivery

When a new crane is delivered, follow the instructions outlined in the latest version of Technical Bulletin General Series #213.

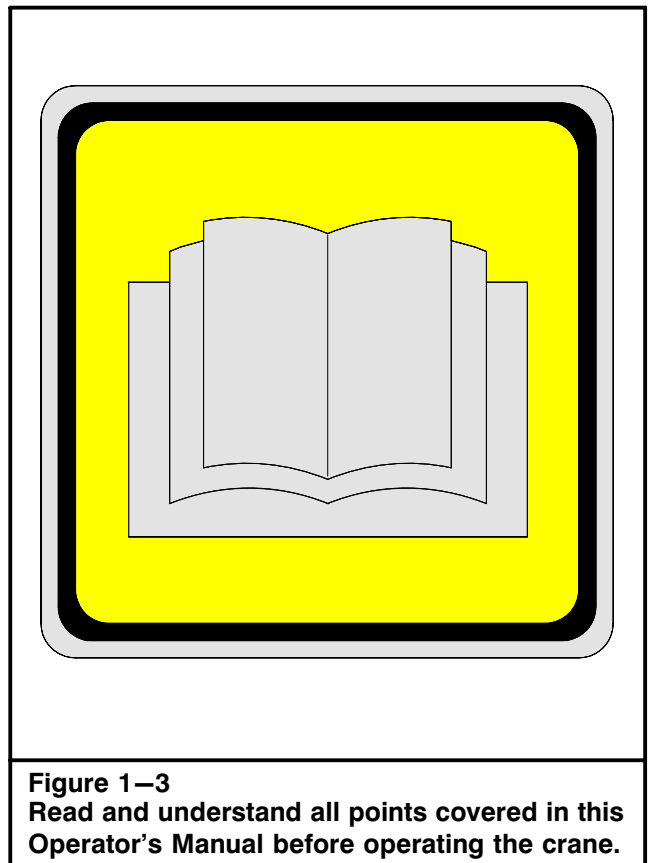
Operating Safety

Remember **SAFETY** every day. Someone's **LIFE** may depend on it, **MAYBE YOUR OWN**.

Safe operations of a hydraulic crane requires a well trained, qualified operator. Crane operation is more involved than it may appear, and operation by a careless or unqualified person can result in a serious accident.

When a hydraulic crane is maintained and used properly it can be a safe, highly productive piece of equipment, but if not used properly, it can be dangerous.

Think Safety — You, the operator, are in charge of an important piece of equipment. It is very important that you know what it can do. It is also important that you know what it should not do. No set of instructions can anticipate all of the situations you will encounter. The rules given here cover the general usage, and some of the more common specific cases. If conditions arise not covered by these rules, contact your Link-Belt Distributor. A phone call could save someone's life.



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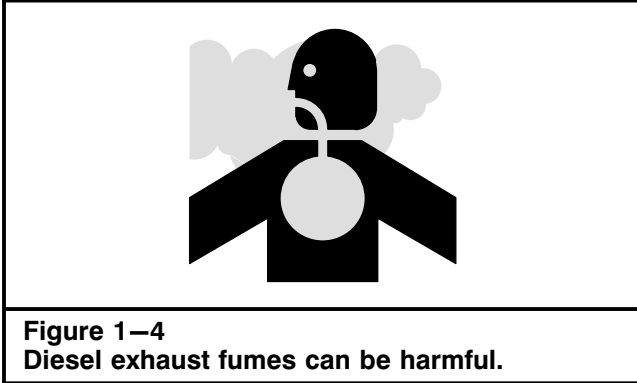


Figure 1-4
Diesel exhaust fumes can be harmful.

General Safety Rules

The following is a list of safety rules which should be followed during all crane operations.

Operator Awareness

1. Read this Operator's Manual and heed it. The manual contains important information.
2. An operator must not eat, read, or otherwise divert his attention while operating a crane. Remember—operating is a full-time job.
3. Start and operate the engine in a well ventilated area. Diesel exhaust fumes can be harmful. If it is necessary to operate in an enclosed area, vent the exhaust to the outside. Properly maintain the exhaust system to its original design.
4. Don't smoke when fueling, or fuel up near an open flame. Keep the nozzle in contact with the filler neck to prevent static electric sparks. Shutdown the engine when fueling.
5. Keep your shoes clean. Before entering the operator's cab, wipe clean any mud, gravel, snow, ice, moisture, or grease from your shoes. Slippery shoes could cause momentary loss of control of crucial foot operated controls.
6. Keep all walking surfaces (steps, ladders, platforms, etc.) and non-skid materials on the crane clean. Non-skid materials are placed on the crane to assist operators and service personnel with safe access/egress to/from the crane and to/from adjustment and inspection areas. Do not allow non-skid materials to become contaminated with mud, snow, ice, oil, paint, wax, etc. Any contamination can cause the non-skid materials to become slick, reducing their effectiveness for safety while walking on the crane. If any non-skid materials become ineffective due to wear, age, or destroyed in any way, they must be replaced.



Figure 1-5
Do not smoke when fueling, or fuel up near an open flame.



Figure 1-6
Keep hands and tools clear of moving parts.

7. Keep fingers, feet, and clothing away from sheaves, drums, and wire ropes unless the crane is shutdown and everyone knows what you are doing. Do not place a hand on wire ropes when climbing on the crane. A sudden movement could pull you into the drums or sheaves.
8. To prevent movement of individual boom sections, shutdown the engine and ensure that the operator has properly vacated the operator's cab before putting hands or tools inside the boom. Unexpected movement of the boom sections could sever fingers, hands, arms, etc.
9. The operator, supervisor, or person in charge of the load must observe the following rules:
 - a. Loads must be well secured before lifting. Ensure that the rigging cannot slip off or pull away from the load, or get out of position on the load. Ensure the load is rigged so it will not turn over.
 - b. Chains and slings must be of adequate size, in good condition, and not twisted around each other.
 - c. The load must not catch on an obstruction when lifting or swinging. Ensure the load, winch wire rope(s), or any other parts of the crane do not snag or strike any obstruction.

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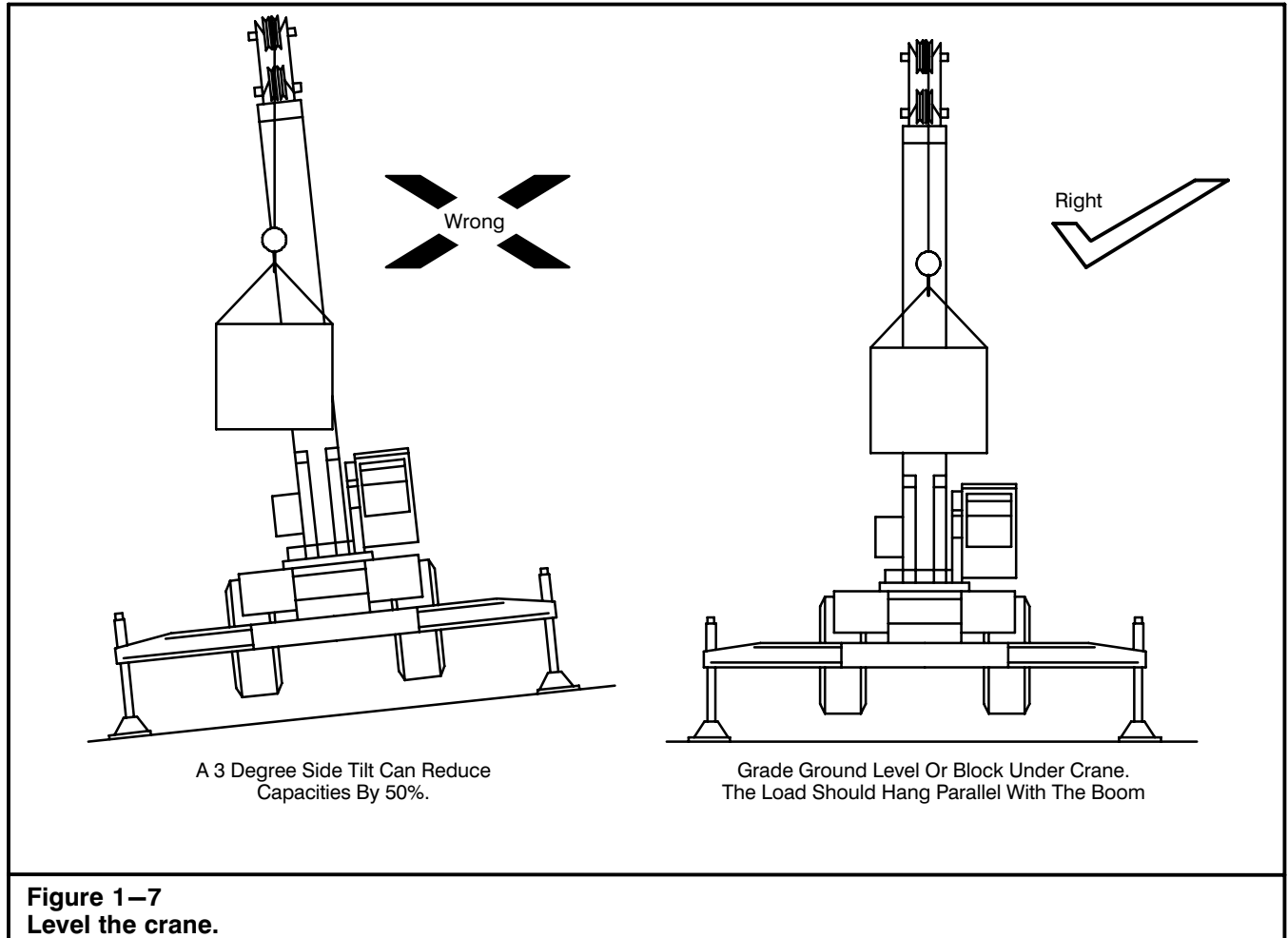


Figure 1-7
Level the crane.

- d. Do not allow the load to rotate out of control. Personal injury to ground personnel, load damage, crane damage, or damage to anti-two block system may occur.
- e. When hoisting with single part line, especially in long falls applications, the design of wire rope and hook ball is crucial to minimize the potential for uncontrolled wire rope and/or load rotation. Rotation resistant wire rope is recommended for single part of line applications. See Wire Rope Capacity Chart in the Crane Rating Manual for the specific types of rotation resistant wire rope recommended for the crane.
- f. Avoid sudden starts and stops. Lift carefully, swing gently, brake smoothly, lower and set loads carefully. Jerking the load, swinging and engaging swing brake roughly, and lowering the load rapidly and slamming on brakes, will put shock loadings and possible side loadings on the boom. Unnecessary abuse labels the operator as a beginner. Be a professional.
- g. Do not wrap the winch wire rope around the load. Do not use discarded, worn, or damaged wire ropes for slings. They may fail and drop the load.
- h. The crane must be level on a firm supporting surface before making a lift. Use the bubble level to level the crane. Check its accuracy frequently with a carpenter's level. Remember, a three degree side tilt can reduce capacities by 50% or more.

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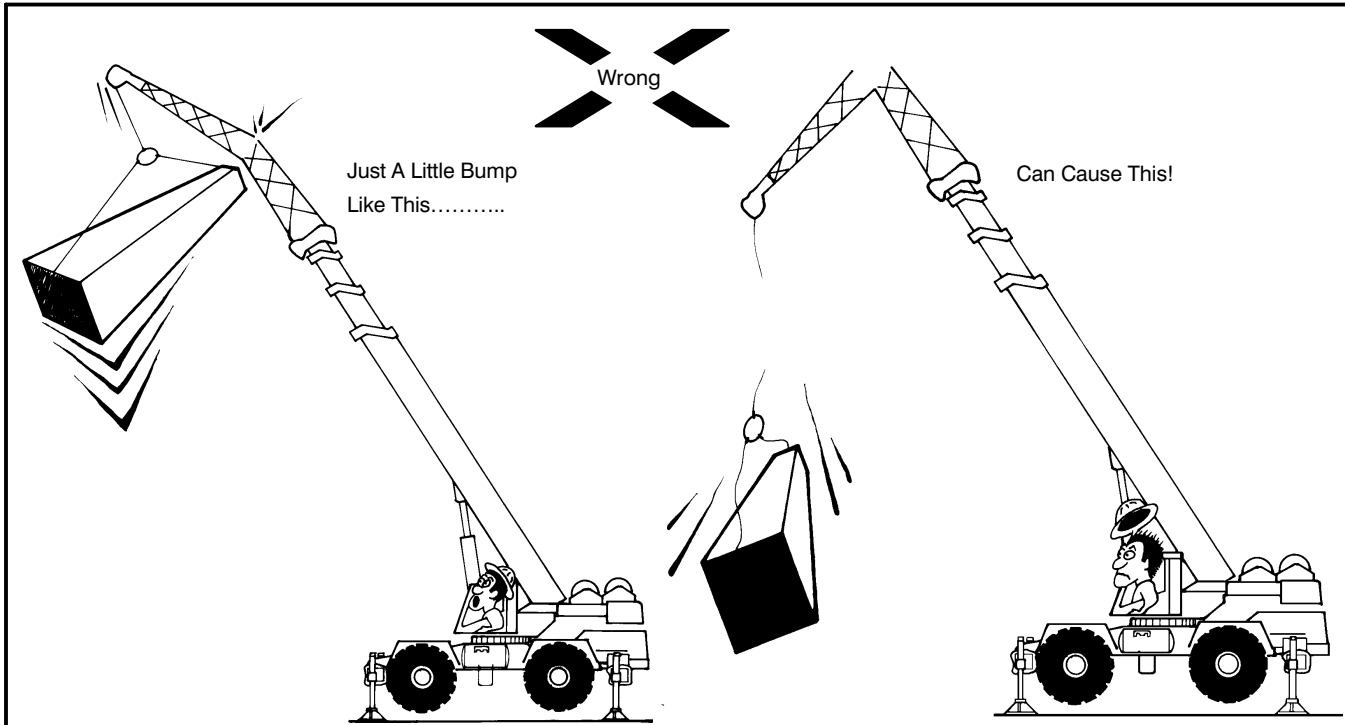


Figure 1-8
Do not let the load hit the boom or fly.

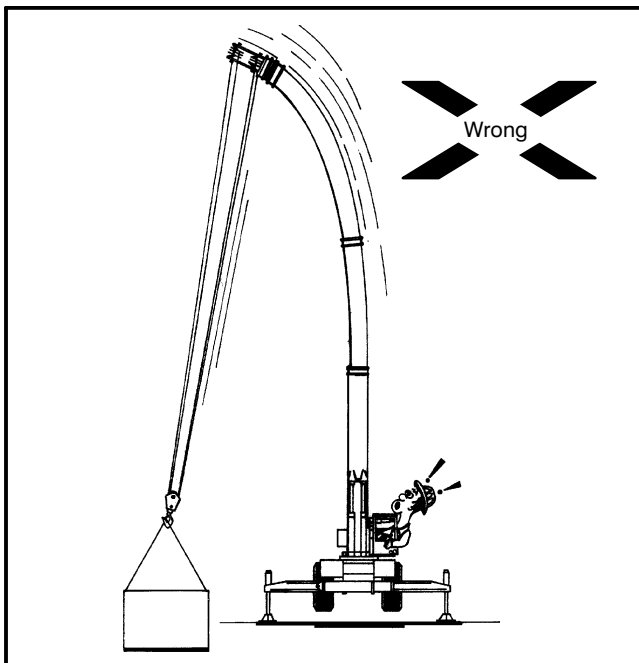


Figure 1-9
Do not use the boom to pull sideways.

10. Operate the crane from the operator's seat only. Operating the crane from any other position, such as reaching in a window, constitutes a safety hazard.

11. Don't let the load or bucket hit the boom or fly. Don't let the boom or attachment rest on, or hit, a building or any other object. A dent or other damage could result, which will weaken the boom or attachment. If there is major damage, the attachment could collapse. If a lattice or diagonal bracing member on the fly is broken, cracked, or bent, contact your Link-Belt Distributor for repair procedures. If the boom or fly is struck, or damaged by anything, STOP. The loading on a boom or attachments increases as they are lowered, therefore their suspension systems could collapse during lowering. Use another crane to lower a damaged boom or attachment.
12. Watch the load or a signal person at all times. A suspended load must have your undivided attention.
13. Don't pull sideways on the boom or fly, not even a little. Lift straight up on every load. Moving trucks, rail cars, barges, or anything else pulling sideways on the winch wire rope could buckle the boom or fly. It could also damage the swing mechanism. Pulling sideways on a boom or fly can overturn the crane.
14. Heat from the sun only on one side of the boom may cause a temperature differential between the sides of the boom. The thermal effects may cause boom distortion (the boom to "deflect" to one side) creating a side load on the boom and/or fly. Side loading is dangerous and shall be avoided.

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15. Do not “two block” (pull the hook block, hook ball, and/or the load into the head machinery) as this can cause winch wire rope and sheave breakage resulting in an accident.
16. After slack winch wire rope operation, ensure the winch wire rope is properly seated in sheaves and on drums before continuing to operate. Use a stick or mallet to set the winch wire rope, not your hands.
17. Do not lower the load beyond the point where less than three full wraps of winch wire rope are left on the drum. This condition could occur when lowering a load beyond ground level. If all the winch wire rope runs off the drum, the load will jerk which could break the winch wire rope.
18. Ensure there is a safety latch on the hook, and that it works properly. Without a latch, it is possible for slings or chains to come off the hook, allowing the load to fall.
19. Don't alter any part of the crane. Additions to or changes in any part of the equipment can create loadings for which the crane was not designed. Such changes may seriously affect the usable capacities and make all capacities in the Crane Rating Manual invalid. Alterations can dangerously overload or weaken critical parts and may cause disastrous failure.
20. Do not exceed the rated capacities of the crane under any circumstances. While a crane has more stability when lifting over a corner (as compared to straight over the side) the crane capacity is not increased. Anytime the load exceeds the rated capacities listed in the Crane Rating Manual, the crane is overloaded. Overloads can damage the crane and such damage could cause failure and accidents.
21. When operating on outriggers, all beams must be equally extended; all fully retracted, all intermediate extended or all fully extended. Jacks must be extended so all tires are clear of the ground, and the crane must be level. Ensure that pontoons are set on firm surface, adequate to support the blocking, pontoon, crane and load without settling, slipping or collapsing. Blocking or matting under pontoons must form a smooth level surface under the entire pontoon. Do not block under outrigger beams inside the pontoons as this reduces stability. Blocking must be under pontoons only. Remember—there are tremendous loadings on pontoons and blocking — the weight of the entire crane plus any load.

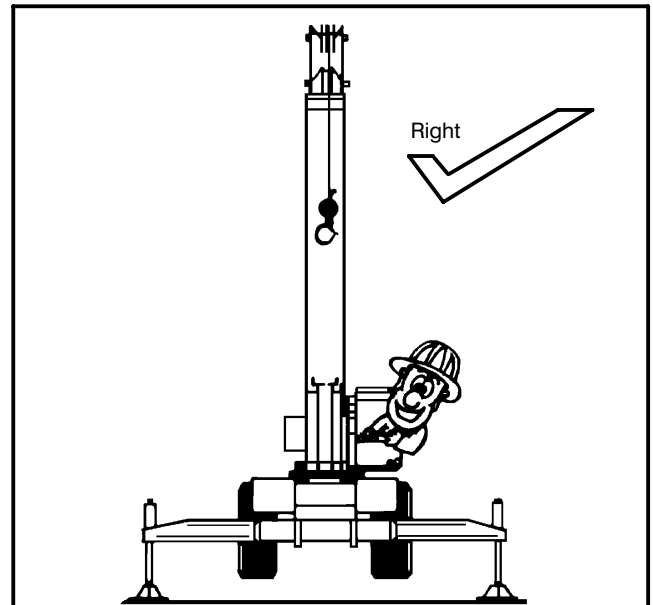


Figure 1–10
Crane level, all beams extended equally (all fully extended, intermediate extended, or fully retracted) and tires clear of the ground.

When blocking or matting under pontoons, ensure that each pontoon is supported fully — no unsupported pontoon area is permissible. Ensure pontoons are on a smooth surface. Rough surface, rocks, etc., under pontoons will cause unequal loadings, and can puncture them, causing them to collapse.

Capacities are based on all outriggers being equally extended: all fully retracted, all intermediate extended or all fully extended. Working on outriggers that are not equally extended will reduce capacities and crane stability considerably and could cause an accident. Do not make any lifts while on outriggers without the outrigger beams equally extended.

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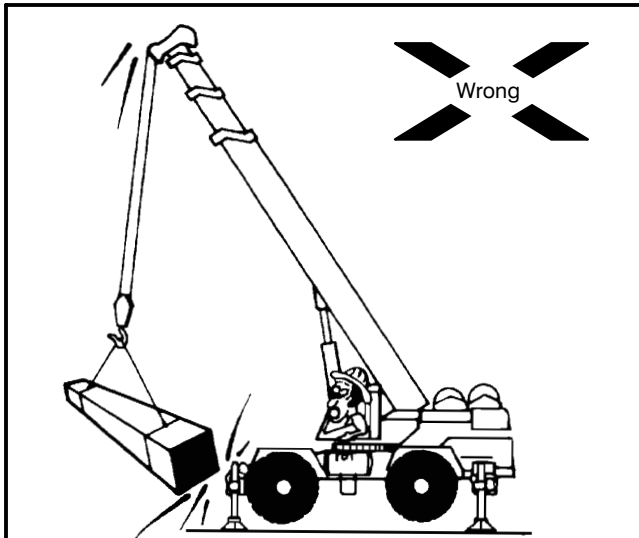


Figure 1-11
Watch that carrier!

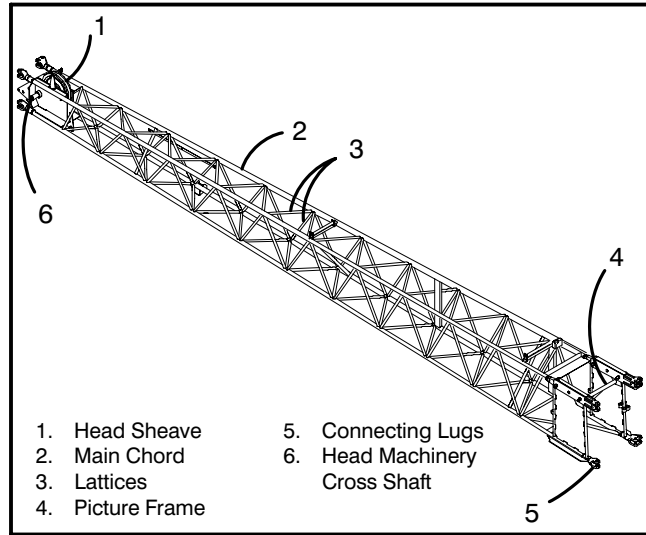


Figure 1-12
Fly Section Nomenclature

22. Cold weather operation requires some special attention by the operator to allow for changes in everyday routines:

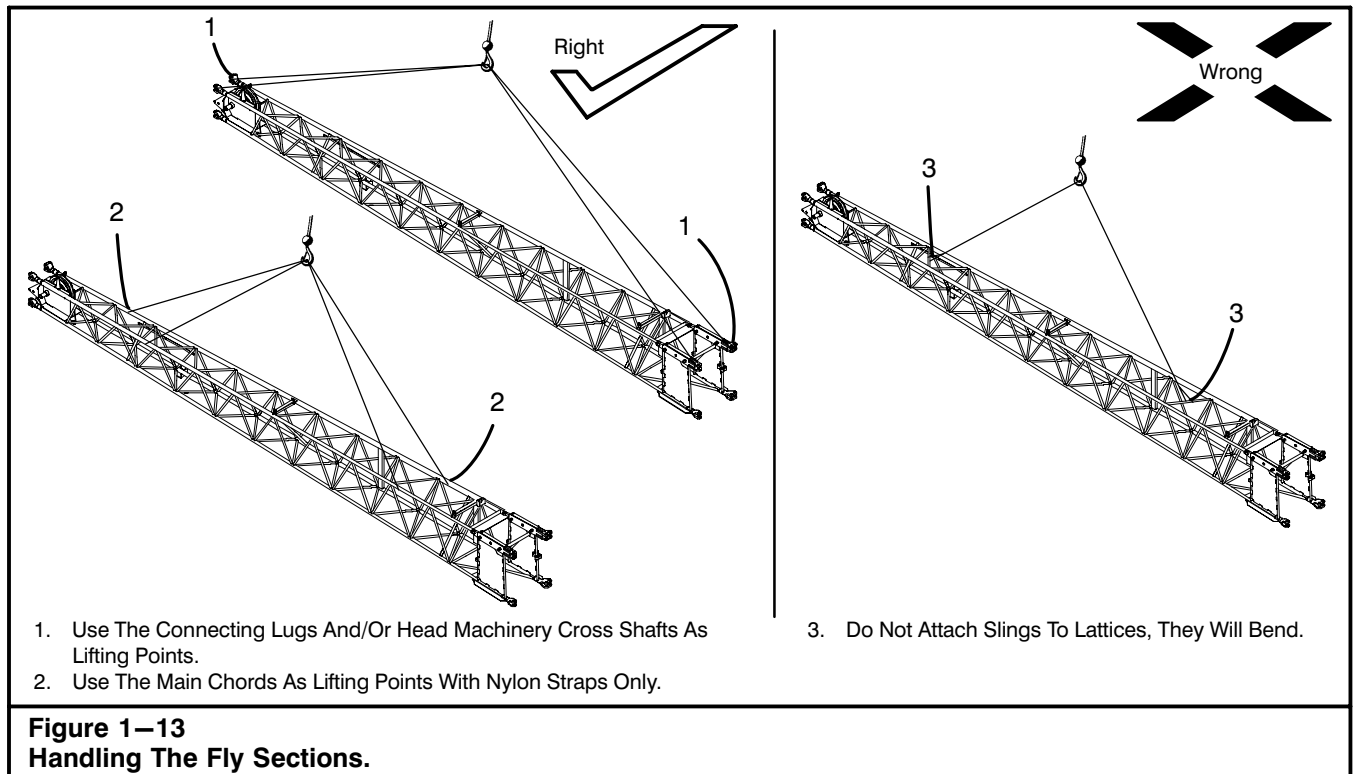
- a. Clean the crane, especially the boom, of accumulated amounts of ice or snow. Operating the crane with an ice covered boom is dangerous. The added weight of the ice or snow can drastically reduce the capacity of the crane. Also, falling ice may pose danger for ground personnel.
- b. Clean all snow and ice from steps, ladders, platforms, etc. to eliminate slippery walking surfaces.
- c. If cold weather starting aids are provided on the crane, use them. The use of aerosol starting sprays can be dangerous if the manufacturer's directions are not closely followed.
- d. Pay close attention to the gauges in the operator's cab when starting the engine. Normal "warm up" times will be longer. Ensure pressures and temperatures are within normal ranges before beginning operations.
- e. Always handle flammable materials according to the manufacturer's instructions. Propane, diesel, or other fuel for auxiliary heaters can be dangerous if not properly handled. Do not store such fuels on the crane.
- f. Use caution when lifting any load during freezing weather, as it may be frozen to the ground or the supporting surface. The added tension, to break the load free, could cause an unexpected overload situation. Also, when the load does finally break loose it could create an erratic motion causing damage or injury.
- g. At the end of the work shift, park the crane where it will not freeze to the ground. Major damage to the drive mechanism could occur while trying to free the crane from a frozen surface.

23. Before attempting to move the carrier, ensure there is enough oil pressure to operate the brakes. Always check the brake operation before traveling the crane.

24. Brake firmly in one application. Avoid fanning the brakes. This could exhaust oil pressure so fast that the pump may not supply enough oil.

25. Do not coast downhill with the transmission in neutral. It makes control of the crane more difficult and dangerous.

26. Shift the transmission to neutral before operating the crane. Crane operation can cause movement which can damage the transmission or drive line. When parking, shift to neutral and engage the park brake. Block wheels if not on a level surface.



27. When operating with the boom at a high angle, use care not to let the load hit the carrier.
28. Use care handling the fly when loading, transporting, and unloading. Damage that occurs during these operations can go undetected and could result in failure of the attachment, once subjected to loading. Do not attach slings to the lattices, when lifting the fly, as they will bend. It is recommended that the connecting lugs and/or head machinery cross shaft be used as the lifting points. However, it is permissible to attach nylon straps around main chords to handle the fly.
29. Block under and between the fly sections when loading them on a transport vehicle. When securing the fly to a transport vehicle, it is best to use synthetic webs or slings. If using wire rope slings, pad the fly to protect it from damage. Do not overtighten the tie downs or the fly may be damaged. Do not use chain tie downs, as they may dent and damage the fly section.
30. Thoroughly inspect all the elements of the fly section before installing it on the crane. Check each main chord, picture frame, diagonal, lattice, and connecting lug for bends, dents, and cracked or corroded welds. Picture frames must be square. Do not use any fly section that is even slightly damaged. Contact your Link-Belt Distributor for the proper repair procedures.

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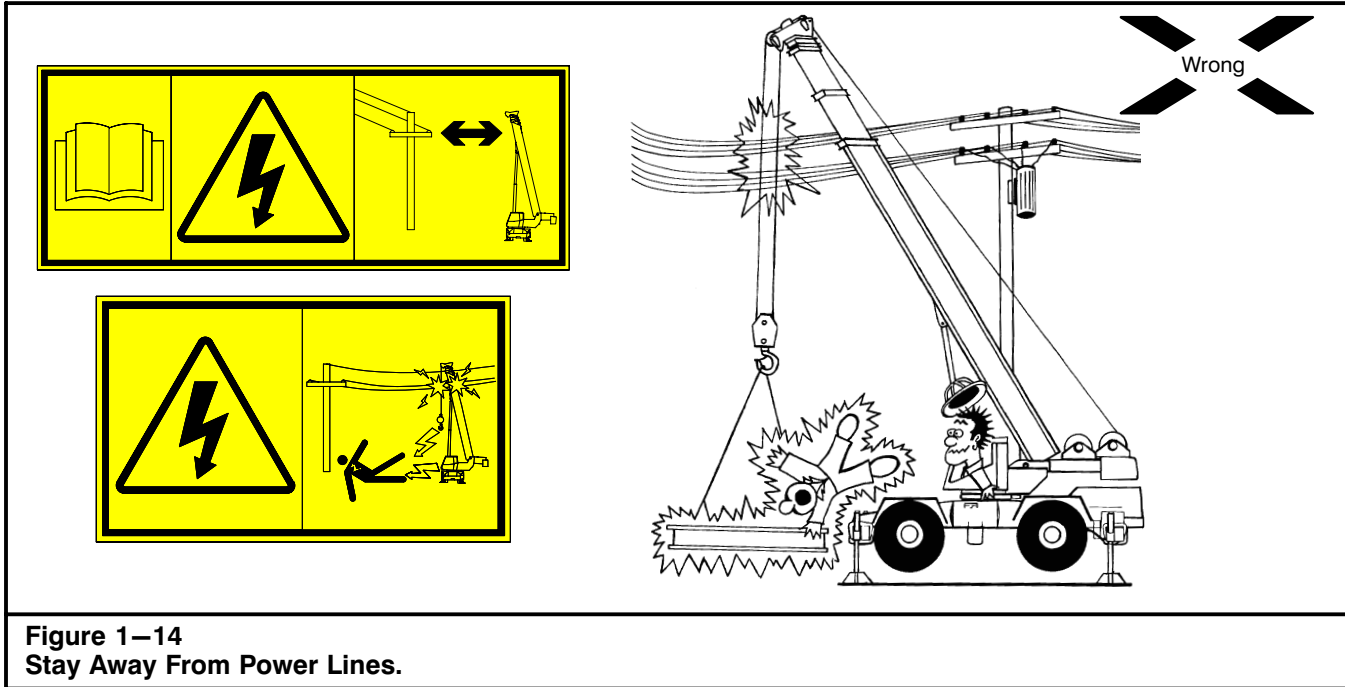


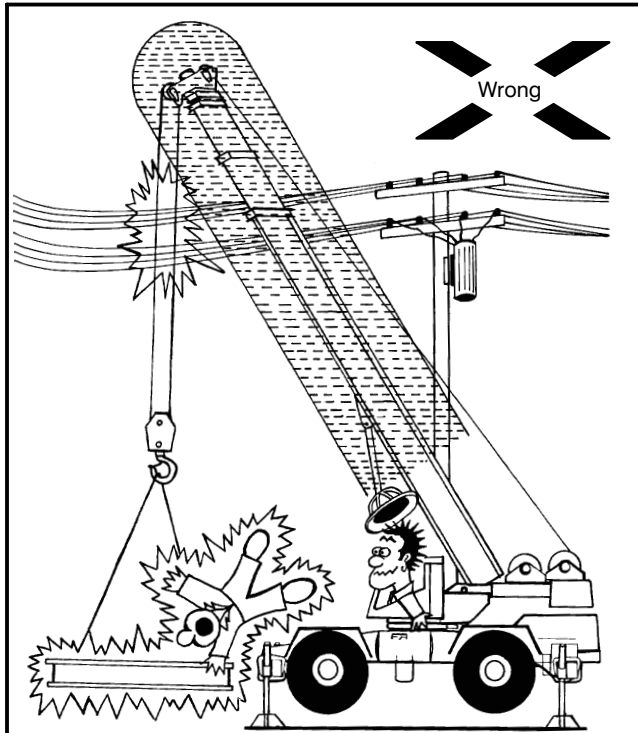
Figure 1–14
Stay Away From Power Lines.

Minimum Clearance When Operating Near High Voltage Power Lines Or During Crane Assembly/Disassembly	
Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance, ft (m) See Note 1
To 200	15 (4.57)
Over 200 To 350	20 (6.10)
Over 350 To 500	25 (7.62)
Over 500 To 750	35 (10.67)
Over 750 To 1000	45 (13.72)
Over 1000	As established by the power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.
Minimum Clearance When Traveling With No Load	
To 345	15 (4.57)
Over 345 To 750	16 (4.87)
Over 750 To 1000	20 (6.10)
Over 1000	As established by the power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.
<p>Note 1: Maintain 50 ft (15.2m) minimum clearance from power lines if voltage is unknown. If unknown but yet known to be less than 350 kV, maintain 20 ft (6.1m) minimum clearance.</p> <p>Note 2: Environmental conditions such as wind, fog, smoke, or precipitation may require increased clearances.</p>	
High Voltage Power Line Clearance Chart	

Electrical Dangers

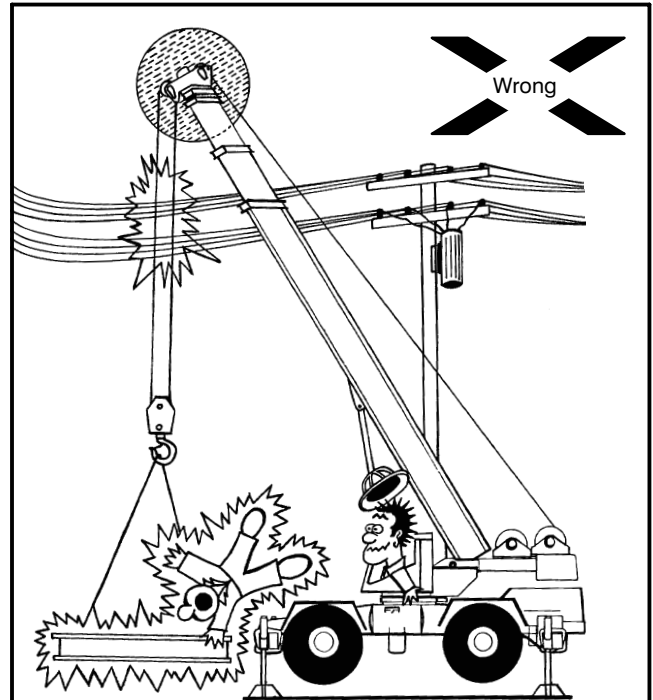
1. All Electrical Power Lines Are Dangerous. Contact with them, whether insulated or not, can cause death or injury. When operating near power lines, the best rule is to have the power company turn off the power and ground the lines. However, in some cases, the operator may be unable to have the power turned off. Follow these rules whether the power is turned off or not. Follow all requirements per OSHA regulations 1926.1407 through 1926.1411 as applicable while assembling, disassembling, operating, or traveling the crane in the vicinity of any power lines.
 - a. Be alert. You are working around conditions which can cause death.
 - b. Keep all parts of the crane – winch wire rope(s), hook block, hook ball, and load – at least the distance from the power line as specified in the “High Voltage Power Line Clearance Chart”, or such distance as required by any other state or local requirements.
 - c. Assume that every line is “Hot”.
 - d. Do not perform any crane assembly/disassembly under any energized power line.
 - e. Appoint a reliable person equipped with a loud signal (whistle or horn) to warn the operator when any part of the crane is working around the power line. This person should have no other duties while the crane is working around the power line.

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Shaded area shows "sensitivity zone" with full boom length sensor used. Contact can be made outside this zone by the winch wire rope(s), cab, etc. In such cases the warning will not sound until contact is made, and the crane is electrified and deadly.

Figure 1-15
Crane equipped with proximity warning device on the entire boom.



Shaded area shows "sensitivity zone" with the probe near the boom peak. Contact can be made outside this zone by the winch wire rope(s), cab, etc. In such cases the warning will not sound until contact is made, and the crane is electrified and deadly.

Figure 1-16
Crane equipped with proximity warning device on boom tip.

- f. Warn all personnel of danger. Allow no unnecessary person in the area. Don't allow anyone to lean against or touch the crane. Don't allow workers or load handlers to hold load, load lines, or rigging gear unless absolutely necessary. Use dry hemp or dry plastic ropes as tether lines. Make certain everyone stays at least the distance away from the load as specified in the "High Voltage Power Line Clearance Chart", or such distance as required by any other state or local requirements.
 - g. The use of boom point guards, proximity devices, insulated hooks or swing limit stops do not assure safety. Even if codes or regulations require the use of such devices, you must follow rules listed here. If you do not follow them, the result could be serious injury or death. Figure 1-15 through Figure 1-18 portray some of the limitations of the devices.
 - h. Grounding the crane can increase the danger. Poor grounding such as a pipe driven into the ground, will give little or no protection. In addition, a grounded crane may strike an arc so heavy that a live line may be burned down. This could cause the crane and the area around it to be electrified.
 - i. When operating near radio or T.V. transmitting stations, high voltage can be induced in metal parts of the crane, or in the load. This can occur even if the crane is some distance from the transmitter or antenna. Painful, dangerous shocks could occur. Contact trained electronic personnel before operating the crane to determine how to avoid electrical hazards.
2. **What do you do if a power line is touched by a crane or load?**
 - a. Remain calm — think — a mistake can kill someone.
 - b. Warn all personnel to keep clear.
 - c. If crane will still operate, try to move it away from contact. You, the operator are reasonably safe in the cab unless the crane is on fire or an arc is cutting through the cab.

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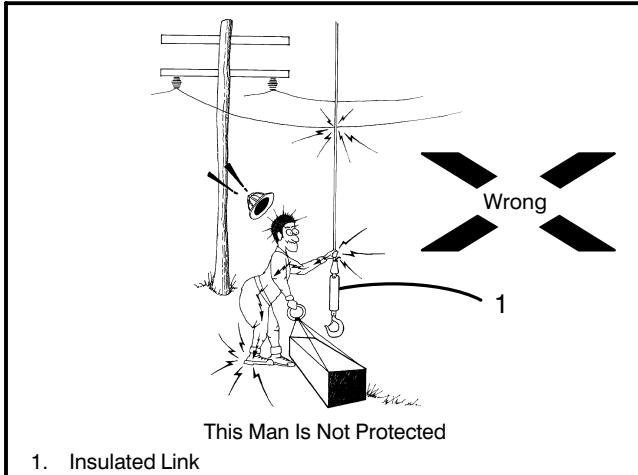


Figure 1-17
Crane equipped with insulated link.

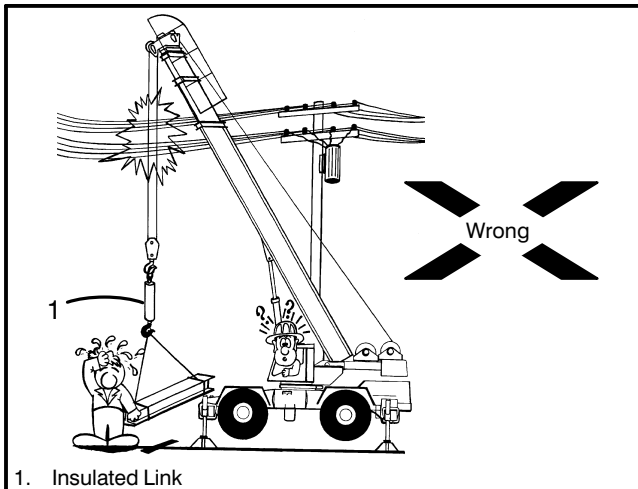


Figure 1-18
Crane equipped with insulated link and boom point guard.

- d. Move away from contact in the reverse direction to that which caused the contact. Example: If you swing left to the wire, swing to the right to break contact. Remember – once an arc has been struck, it will stretch out much farther than you think before it breaks. Keep moving until the arc has been broken.
- e. When the arc breaks, continue moving until you are at least the minimum distance away as specified in the “High Voltage Power Line Clearance Chart”, or such distance as required by any other state or local requirements. Stop the crane. Thoroughly inspect crane for damage. Repair any damage before further use.
- f. If you cannot disengage from the electrical line, and the crane is not on fire or no arc is cut-

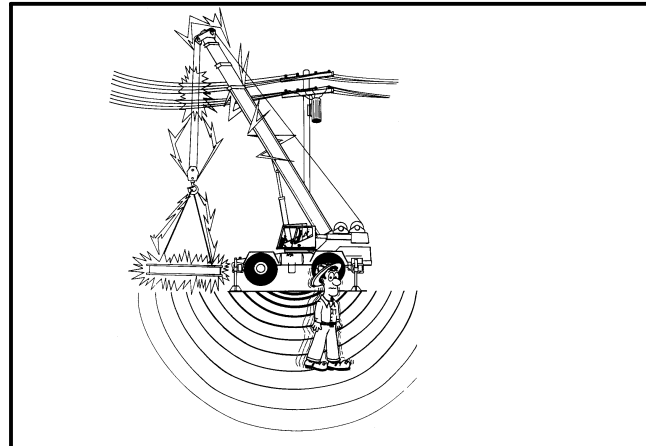


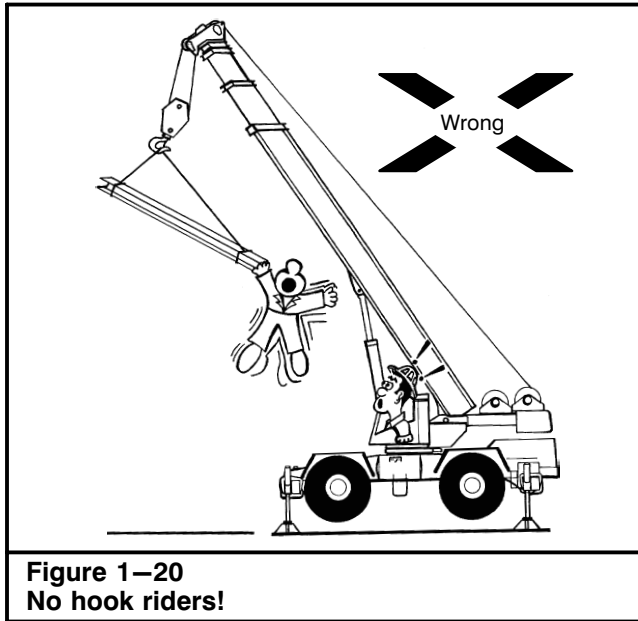
Figure 1-19
If you must leave the crane, do not step off. Leap as far as you can with feet together and hop or shuffle away from the crane.

- ting through the cab, stay in your seat until power line can be turned off.
- g. If you must leave the crane, don't step off. Leap from the crane as far as you can, landing with feet together, then hop away from the crane with feet together, or shuffle feet to keep them close together. This could help prevent personal injury.
3. When using a magnet:
 - a. Lifting magnet generators produce voltage in excess of 200 volts and present an electrical shock hazard. Only trained personnel should work on the magnet, controller, or wiring. Don't open the controller door with the generator running.
 - b. Do not let workmen touch magnet or load.
 - c. Do not let workmen get between magnet and a metal object.
 - d. If necessary to position a load, use a dry, wooden stick.
 - e. Open magnet disconnect switch at magnet control panel before connecting or disconnecting leads.

Radio Frequency Or Electro Magnetic Interference (RFI Or EMI)

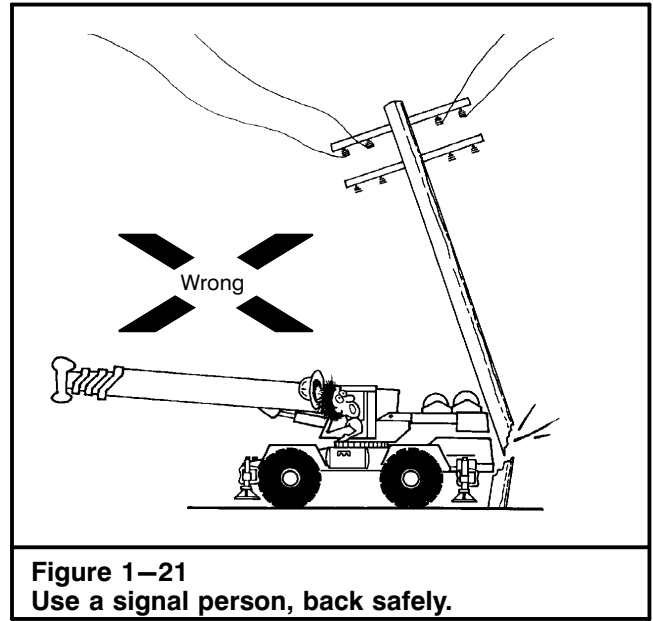
Certain areas may contain high Radio Frequency Or Electro Magnetic Interference (RFI or EMI). In these areas the boom can act like an antenna and produce an electrical current that may cause electrical shocks and/or the crane to malfunction. If operating in an area where these conditions may exist, test the crane or have the area tested for the magnitude of this interference before operating the crane. Operation may not be possible or boom length may be limited. Comply with all local, state, and federal laws when operating in high RFI/EMI areas.

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Protective Equipment

1. Always replace protective guards and panels before operating the crane.
2. Always wear hard hats, safety glasses, steel toe shoes, hearing protection, and any other safety equipment required by local job conditions, OSHA, or regulations.
3. Always wear safety glasses when drilling, grinding or hammering. Flying chips could injure the eyes.
4. Always wear a mask to prevent breathing any dust, smoke, fumes, etc. while cleaning, drilling, welding, grinding, sanding, etc. on any part of the crane. Breathing dust, smoke, fumes, etc. can be very hazardous.
5. The crane is equipped with a fire extinguisher in the operator's cab. Ensure all personnel know that one is available and where it is located. It must be kept in the crane at all times (except when needed). Instruct all operating and maintenance personnel in proper use of the extinguisher. Check periodically to ensure it is fully charged and in working order. Replace immediately if required.
6. Do not tamper with safety devices. Keep them in good repair and properly adjusted. They were put on the crane for your protection.
7. When operating a crane equipped with any form of load indicating mechanism, overload warning system, or any automatic safety device, remember that such devices cannot replace the skill and judgment of a good operator. For instance, such devices cannot tell when a crane is setting on a supporting surface that will give away, that too few parts of line are being used to lift a load, cannot correct for the effects of wind, warn that the

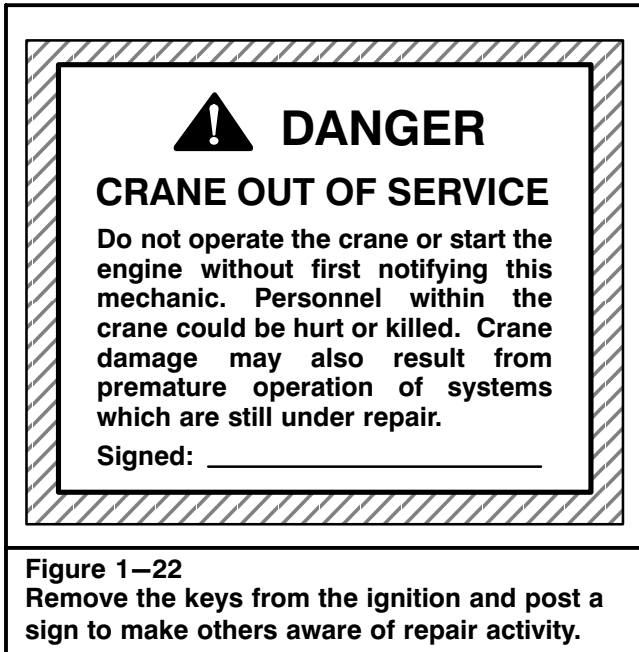


device may be improperly adjusted, correct for side pulls on the boom, or for many conditions which could occur and create hazards. It requires all the skill, experience, judgment, and safety consciousness that a good operator can develop to attain safe operation. Many safety devices can assist the operator in performing their duties, but they should not rely on them to keep them out of trouble.

Signal Persons And Bystanders

1. Don't allow crane boom or loads to pass over people, or endanger their safety. Remove all loose objects from load. All unnecessary personnel should leave the immediate area when crane is operating.
2. Do not allow anyone to ride on the hook block, hook ball, or any part of the load or attachment for construction work or recreational activities. (This applies to recreational activities such as "bungee jumping" or "bungee cord jumping".) Cranes are intended to lift objects, not people. They are not elevators.
3. Do not carry passengers! There is only one seat and it is for the operator. Do not allow personnel to ride on the carrier deck during operation or while traveling the crane. A fall from the crane can cause death or serious injury.
4. Always look before you back up and post a signal person to guide you. Ensure the back up alarm is working properly. Use the horn as a signal. Use a code such as one beep – stop, two beeps – forward, and three beeps – backward. Ensure everyone on the job site knows the code.
5. Do not make a lift which is not in plain sight without a signal person. This can lead to an accident or crane damage.

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Crane Inspections And Adjustments

1. Inspect crane daily. Do not operate a damaged or poorly maintained crane. Pay particular attention to the clutches, brakes, attachments, and wire ropes. If a component is worn or damaged, replace it before operating.
2. Labels, decals, plates, etc. should be periodically inspected and cleaned as necessary to maintain good legibility for safe viewing. If any instruction, caution, warning, or danger labels, decals, or plates become lost, damaged, or unreadable, they must be replaced.
3. When performing repetitive lift applications, especially at or near maximum strength limited capacities, an inspection of the major structural areas of the crane, for cracks or other damage, should be conducted on a regular basis. (A non-destructive test such as magnetic particle or dye penetrant may even be considered.) Along with inspection for cracks and damage, frequently check the critically loaded fasteners, such as the turntable bearing mounting capscrews, to ensure they have not been stretched. Not only does frequent inspection promote safety, but it is also much easier and less expensive to perform a repair when a crack is small, before it has a chance to traverse through a structural member. Any sign of cracks or damage must be repaired before continuing operations. Contact your Link-Belt Distributor for repairs.
4. When performing maintenance on the crane, do the following:
 - a. Fully retract the boom. Lower the boom to the limit of the boom hoist cylinders.
 - b. Shutdown the engine, disengage the main pump, and work all control levers back and forth to relieve pressure and relax the attachment.
 - c. If the above instructions cannot be followed, block securely under the attachment so it cannot move.
 - d. Bleed any precharge off the hydraulic reservoir before opening it or disconnecting a line.
 - e. Hydraulic oil becomes hot during operation. In some cases it becomes hot enough to cause severe burns. Be careful not to let hydraulic oil come in contact with skin.
 - f. Post warning signs in cab so no one will try to start the engine. Do not adjust, maintain, or repair a crane while it is in operation without visual and/or verbal contact to ensure the safety of service personnel.
5. When making repairs, which require welding, use proper welding procedures. Also the following precautions must be taken:
 - a. All paint in the area should be removed to prevent burning the paint. The smoke and fumes from the burning paint can be very hazardous.
 - b. The welding ground cable should be attached to the portion of the crane being welded. If welding on the upper, ground on the upper. If welding on the carrier ground on the carrier. Failure to take this precaution may result in electrical arcs in the turntable bearing.
 - c. The welding ground cable should always be connected as close as possible to the area being welded. This minimizes the distance that electricity must travel.
 - d. Disconnect computers and other electronic equipment (such as rated capacity limiters and engine computers) to prevent damage. Contact your Link-Belt Distributor for proper procedures.
 - e. If crane is equipped with a 12V to 24V converter in the power panel, remove the fuses before welding.
 - f. Remove all flammables from the proximity of the welding area.

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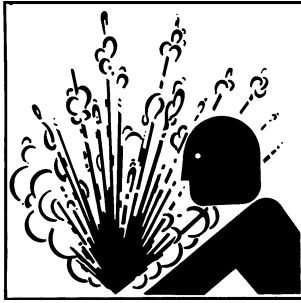


Figure 1-23
Allow engine to cool before removing the radiator/surge tank cap.

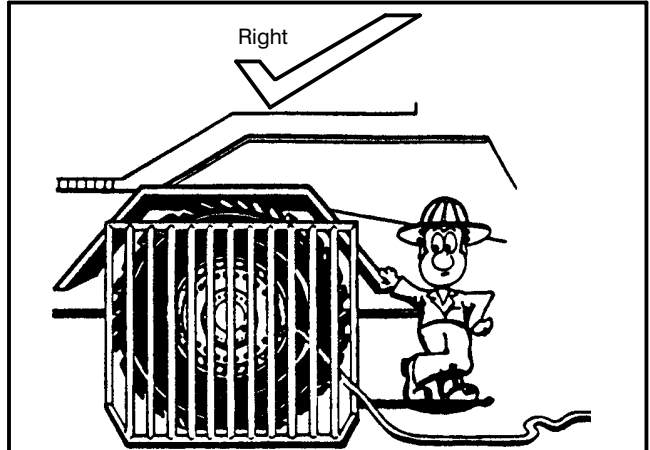


Figure 1-24
Use a guard when inflating tires.

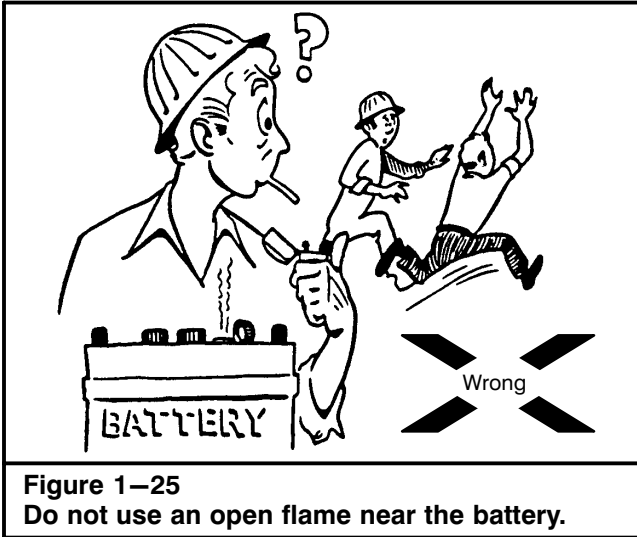
6. Keep the crane clean, in good repair, and in proper adjustment. Oil or grease on the decks may cause falls. Improper adjustments can lead to crane damage, load dropping, or other malfunctions.
7. Keep all walking surfaces (steps, ladders, platforms, etc.) and non-skid materials on the crane clean. Non-skid materials are placed on the crane to assist operators and service personnel with safe access/egress to/from the crane and to/from adjustment and inspection areas. Do not allow non-skid materials to become contaminated with mud, snow, ice, oil, paint, wax, etc. Any contamination can cause the non-skid materials to become slick, reducing their effectiveness for safety while walking on the crane. If any non-skid materials become ineffective due to wear, age, or destroyed in any way, they must be replaced.
8. Use extreme caution when removing radiator/surge tank caps, hydraulic pressure caps, etc. They can fly off and hit you, or you could be burned by hot oil, water, or steam.
9. Check tires daily for correct pressure. Do not stand in front of a tire when inflating it. The lock ring can fly off and injure you. Use a clip on inflator, and stand aside. Use a guard in front of the tire.
10. When checking battery fluid level, use a flashlight, not an open flame. If the battery explodes, you can get acid in your eyes, which could cause blindness. Don't check battery charge by shorting across posts. The resulting spark could cause the battery to explode. Check with a tester or hydrometer. Don't smoke near batteries.
11. When using jumper cables to start an engine, connect the negative post to negative post, and positive post to positive post. Always connect the two positive posts first. Then make one negative post connection. Make the final negative connection a safe distance from the battery. It can be made on almost any bare metal spot on the crane. Any spark could cause the battery to explode. Refer to "Jump Starting the Crane" in this Section of this Operator's Manual for the proper procedure.
12. Test the automatic winch brake by raising the load a few inches (*centimeters*) and holding. It should hold without slipping. It takes more braking power to hold a load in the air when the drum is full of wire rope than when it is a few inches (*centimeters*) above the ground with only a few wraps on the drum.
13. Always reduce pressure in hydraulic system to zero before working on any part of the system.
14. Use extreme care when working with circuits with accumulators. Check that hydraulic pressure is relieved before opening the circuit for repairs.
15. When setting pressures, never exceed the manufacturer's ratings. Always follow instructions exactly. Over pressurization can cause hydraulic component damage or failure of mechanical parts on the crane. Either of the above can lead to an accident.



WARNING

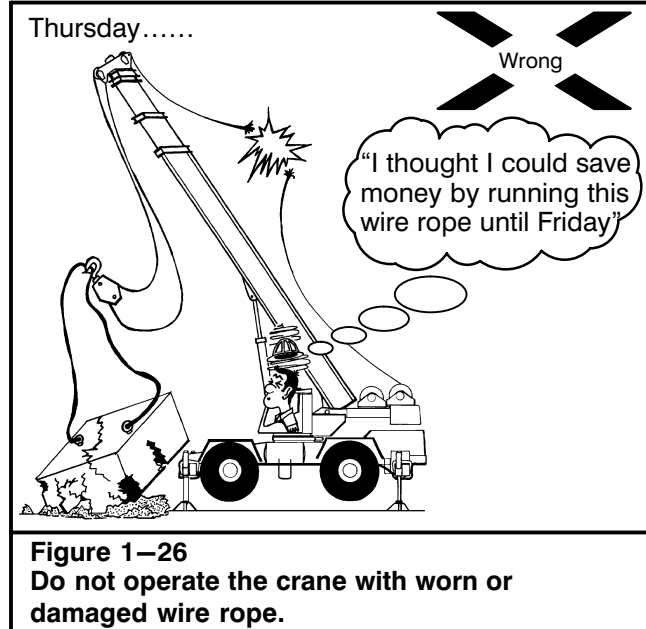
Battery posts, terminals, and related accessories contain lead and lead compounds. Wash hands after handling.

Operator's Manual



Wire Rope

1. Inspect all wire rope thoroughly. OSHA (Occupational Safety And Health Act) regulations state “a thorough inspection of all wire ropes shall be made once a month and a full written, dated, and signed report of the wire rope condition be kept on file where readily available.” A visual inspection must also be performed daily. Replace any worn or damaged wire rope. Pay particular attention to winch wire ropes. Check end connections (pins, sockets, wedges, etc.) for wear or damage.
2. Use at least the number or parts of winch wire rope specified on the Wire Rope Capacity chart in the Crane Rating Manual to handle the load. Local codes may require more parts of line than is shown. Check code requirements and use them where applicable.
3. Non-rotating, rotation resistant, or spin resistant wire ropes are recommended for single part of line applications. This is of utmost importance for long fall hoist line applications. Only if certain criteria are met may a swivel hook ball be used with rotation resistant rope. Refer to “Hook Ball Usage With Rotation Resistant Wire Rope” in Section 5 of this Operator's Manual.
4. Do not handle wire rope with bare hands. Always use gloves to prevent possible injury from frayed or damaged spots in the wire rope.
5. Inspect head machinery and hook block often as damaged or deteriorating sheaves can cause undue wear of the wire rope.
6. When reeving wire rope on the crane, do not stand, walk, or climb on the boom or attachment. Use a ladder or similar device to reach necessary areas.



Crane And Area Clearance

1. Know your job site conditions. Familiarize yourself with work site obstructions and other potential hazards in the area which might lead to mishaps. If possible, make any necessary arrangements to eliminate any potential hazards.
2. Erect barricades around the immediate work area to prevent unauthorized personnel from wandering onto the job site.
3. Ensure your work area is clear. Ensure you have proper clearance for the crane, boom, and load. Don't swing, travel, lift, or lower loads, raise or lower jacks, without first making sure no one is in the way. If your vision is obscured, locate a signal person so you can see them, and they can see all areas you can't. Follow their signals. Ensure you and the signal person understand each other's signals. See Hand Signals Chart in this Section of this Operator's Manual. Use the horn to signal or warn. Ensure everyone on the job site understands signals before starting operations.
4. When working inside a building, check overhead clearance to avoid a collision. Check load limits on floors or ramps so as not to crash through.
5. Don't operate close to an overhang or deep ditch. Avoid falling rocks, slides, etc. Don't park crane where a bank can fall on it, or it can fall in an excavation. Don't park where rain can wash out footing.
6. Watch the tailswing of the upper revolving frame and counterweight. Even though the original set-up may have been clear, situations change.
7. Do not store material under or near electrical power sources. Make material handlers aware of the dangers involved with storing material under power lines or in the vicinity of any other hazards.

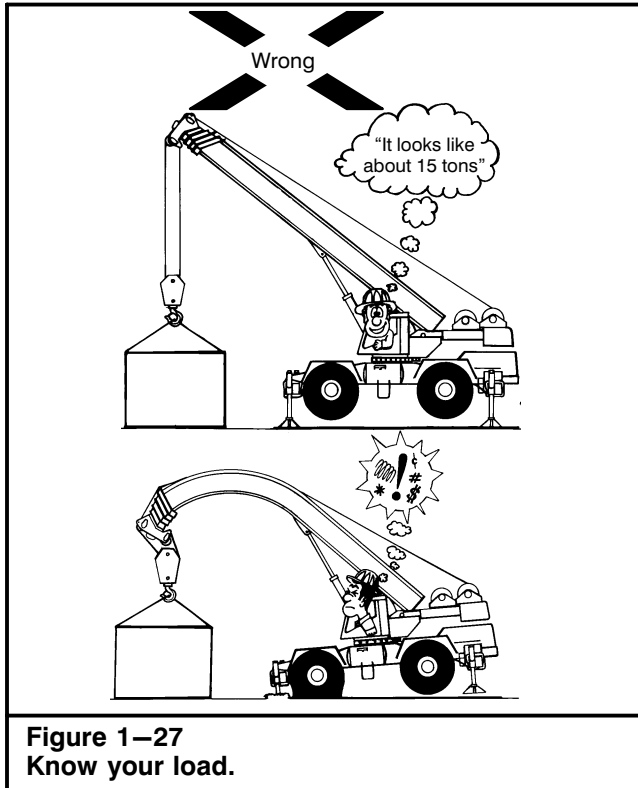


Figure 1-27
Know your load.

Weights, Lengths, And Radii

1. Know your load. Don't try to guess or estimate the load. Use a scale or a load indicating system to determine exact weight. Remember the weight you are lifting includes the weight of any lifting slings or gear, the hook block, hook ball, and any other weight on the hook. If lifting off the boom with the fly installed, the weight of the fly and rigging must also be considered as part of the load. The total load weight must never exceed the rated capacity of the crane, as listed in the Crane Rating Manual, for the position, boom length, load radius, and condition of operation being used. Remember – capacity chart ratings in the Crane Rating Manual are based on ideal conditions:
 - a. Standing on firm, level surface.
 - b. Calm wind.
 - c. No side loads or out swing of load.
 - d. Good visibility.
 - e. Crane in top condition and equipped as when leaving the factory.

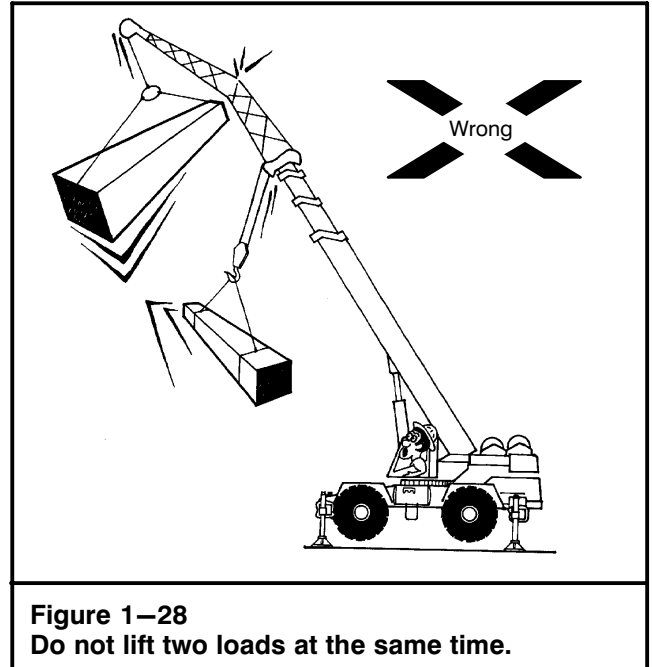


Figure 1-28
Do not lift two loads at the same time.

When such conditions cannot be attained, loads being handled must be reduced to compensate. The amount loads are reduced depends upon how good or how poor actual operating conditions are. It is a matter of judgment and experience. Some factors which may require reduction of capacities are:

- a. Soft or unpredictable supporting surfaces.
- b. Wind.
- c. Hazardous surroundings.
- d. Inexperienced personnel.
- e. Poor visibility.
- f. Fragile loads.
- g. Crane in poor condition.
- h. Condition and inflation of tires.

When in doubt, do not take a chance. Reduce ratings more than you think you need. Avoid working a crane in high winds. If you must work in a wind, reduce capacities as shown in "Wind Speed Restrictions" in the Crane Rating Manual. Wind blowing against the load and the boom produces a side load on the boom and reduces its capacity.

When lifting loads in a wind which have large surface areas, such as building panels, the movement of the load may pose a danger to workmen or building structures. Out swing of a load will increase the load radius, and may overload the crane. This could lead to boom failure or the crane tipping.

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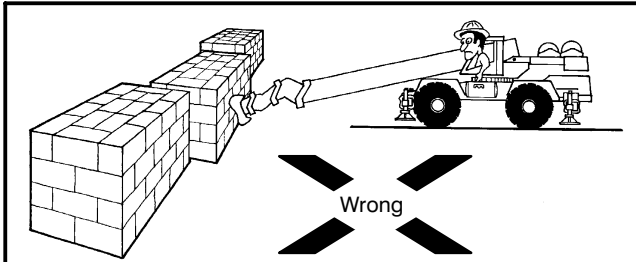


Figure 1-29
Do not push with the boom.

2. When operating off the main boom with the fly erected, deductions must be made for its weight. The weight of the fly must be subtracted to obtain a "NET" capacity. Failure to do so could result in an overloading condition and cause boom failure. Refer to the Crane Rating Manual for amounts to be deducted.
3. When operating off the main boom with the auxiliary lifting sheave installed, the weight of the auxiliary lifting sheave must be deducted. Refer to the Crane Rating Manual for amount to be deducted.
4. Do not lift two loads at the same time, even if the total load weight is within crane capacity. Loads on the boom and fly at the same time, stress the boom and drastically reduce its ability to handle loads. Your full attention cannot be given to both loads, creating a dangerous situation.
5. Lifts where two or more cranes work together can be hazardous and should be avoided. Such lifts should be made only under the direction of a qualified engineer. If a multiple crane lift is unavoidable, observe the following rules:
 - a. The cranes must be level and setting on firm surfaces.
 - b. The cranes should be the same size and capacity, use the same boom length and be reeved similarly.
 - c. Cranes must be positioned so that each boom point is directly over its load attaching point. The winch lines must be vertical during all phases of the lift.
 - d. The rigging must be placed so each crane lifts a share of the load well within the crane's capacity.
 - e. Ensure that during handling more load is not transferred to any crane than it can handle.
 - f. Don't attempt to travel when making multiple crane lifts.
 - g. Coordinate plans with the other operator before beginning to lift.
 - h. Use only one signal person.
 - i. Use of an operable load and angle indicating system is desirable.

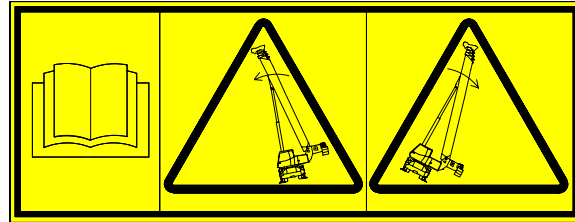
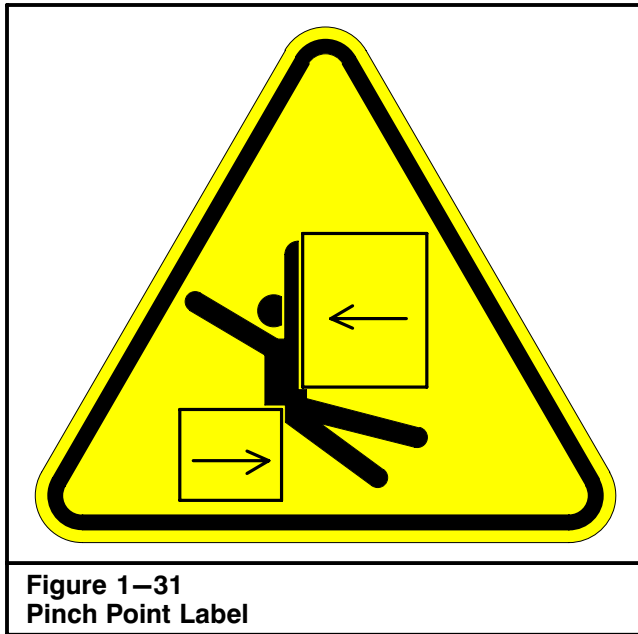
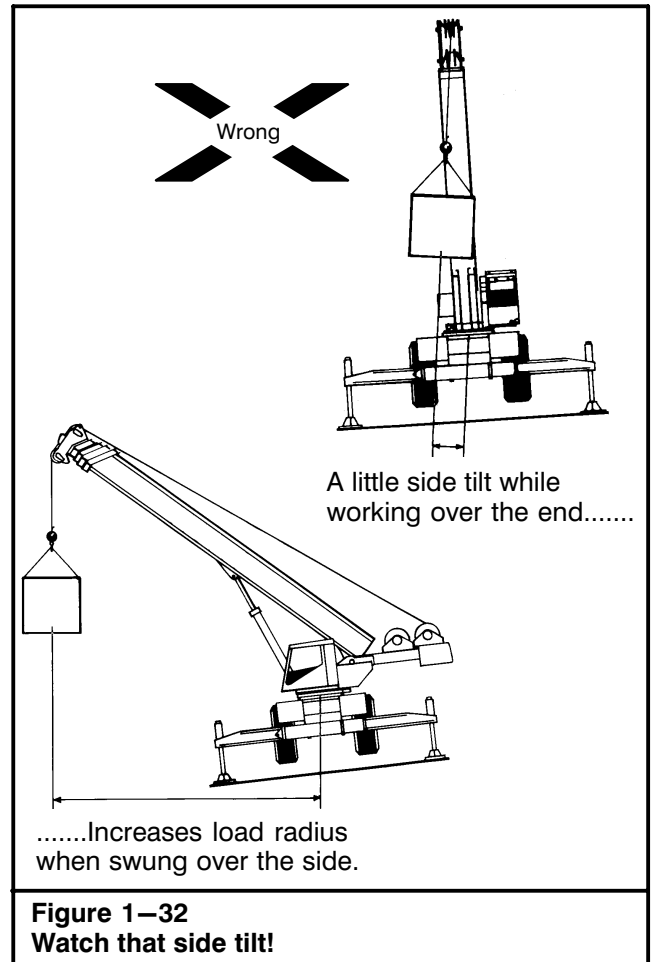


Figure 1-30
Safety Instruction Label

6. Some capacities on hydraulic cranes are based on strength of materials. In these cases, overloads will cause something on the crane to break, before it will tip. Do not use signs of tipping as a warning of overload.
7. Don't lash a crane down. Lashing a crane down encourages overloading. Crane damage or injury could result.
8. Do not shock load and/or overload the crane at anytime. Shock loading or overloading the crane will reduce the fatigue life of crane components and could result in component failure.
9. When performing repetitive lift applications, especially at or near maximum strength limited capacities, be aware that these applications may reduce component life. These applications include repeated lifting (or lifting and swinging) of near 100% strength limited capacities and repeated lifting maximum moment loads. These applications may fatigue the major structural portions of the crane. Although the crane may not break during these applications, they can reduce the fatigue life and shorten the service life of the crane. To improve the service life, while performing repetitive lift applications, consider reducing the capacities to 70% of maximum strength limited capacities to reduce fatigue cracking. Frequently perform a thorough inspection of all the structural areas of the crane. Any sign of cracks or damage must be repaired before continuing operations. Contact your Link-Belt Distributor for repairs.
10. Always refer to the Crane Rating Manual after changing the arrangement of the attachments for the correct lifting capacities.
11. The boom must be extended in the correct manner before making a lift. The capacities listed in the Crane Rating Manual for this crane are based on the boom sections being extended in accordance with each specific boom mode as described in the Crane Rating Manual.

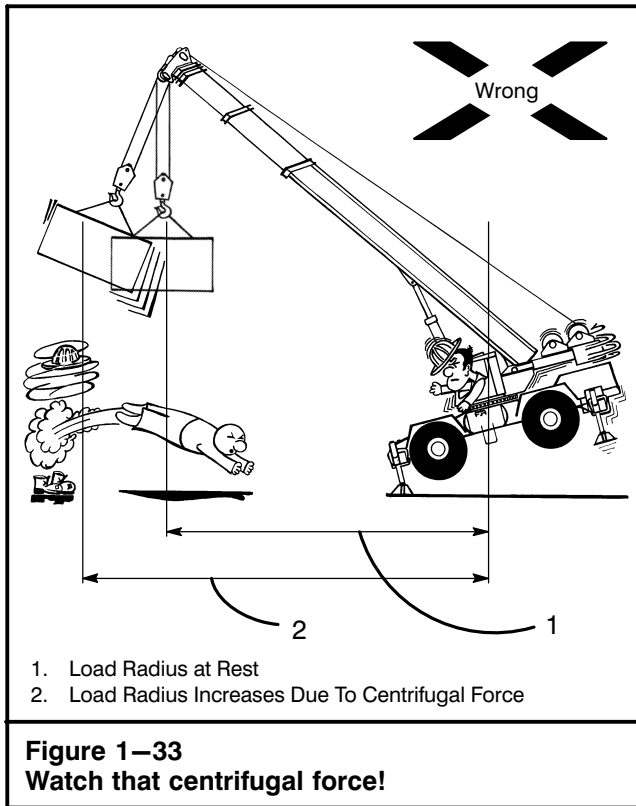


12. Do not use the boom to push or pull. It is not designed for this purpose. Such action can damage the boom and lead to an accident.
13. Know the load radius. Don't guess at it. Determine the load radius by using the boom angle indicator, the boom length indicator, and the Crane Rating Manual, or measure it with a steel tape. Remember – Radius is the horizontal distance from the center-line of rotation of the upper to the center of gravity of the load, when the load is hanging free.
14. Do not operate a hydraulic crane at radii or boom lengths where the capacity charts in the Crane Rating Manual shows no capacity. Don't use a fly not designed for your crane. Either of the above can tip the crane over or cause attachment failure. In some cases, the crane can tip over with no load on the hook, forward or backward! Also, if the boom is fully extended at a low angle, the crane may tip until the boom touches the ground. In any of these cases, injury or crane damage could result.
15. When a load is lifted with any crane, the load may swing out, or sideways. The load radius will increase. Due to the design of hydraulic crane booms, (cantilever boom, supported by cylinders and overlapping sections) this increase is much more pronounced. The increase or out swing of the load can overload the boom, and lead to boom failure or tipping. Also, movement of the load can cause it to hit something. Ensure the load being lifted will remain within capacity as it is lifted and the boom deflects.



16. When extending or lowering a boom with a load, the load radius increases. As the load radius increases, capacity decreases. If capacity is exceeded, the boom may bend or the crane may tip over. Sometimes at low angles, a hydraulic crane boom can be extended with a load, but cannot be retracted. This is because more power is available in the boom cylinders to extend than to retract. If an operator extends the boom under load, he may not be able to retract the boom and may get into a dangerous situation.
17. Know the boom length. Don't guess. Use of an incorrect boom length can cause an accident.
18. When lowering or retracting the boom, the load will lower. To compensate for this, the operator must hoist up on the winch wire rope. Otherwise, movement of the load may cause an accident. When extending the boom, the load will raise. The operator must hoist down the winch wire rope to keep the load in place. Extending the boom without winching down, can lead to "two blocking". This is when the hook block, hook ball, and/or the load contacts the head machinery. Two blocking can lead to sheave or wire rope damage.

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19. The winch wire rope must be vertical when starting to lift. If not, the load will swing in, out, or sideways when lifted from the ground. The crane will lean toward the load when lifting heavy loads. This is caused by elasticity of the crane and the boom. This lean will increase operating radius so the load will swing outward when it clears the ground. This out swing is dangerous to anything in the path of the load, and because of the increase in load radius may overload the crane. To overcome this out swing, boom up as the load is lifted so winch wire ropes remain vertical. When setting the load on the ground, lower boom after the load touches down to avoid hook block and/or hook ball swing when it is unhooked from load.
20. Pinch points, which result from relative motion between mechanical parts, can cause injury. Keep clear of the rotating upper or moving parts.

21. Lifting heavy loads can cause the crane to tilt or lean toward the load. When swinging a load from over the end to over the side, the tilt of the crane will increase. Since tilt acts to increase load radius, it must be compensated for when swinging the load. Swing slowly. Change boom angle (raise the boom) while swinging, to maintain a constant radius, and prevent in swing or out swing of load. If not, a dangerous condition could result.
22. Watch out for centrifugal force when swinging a load. Swing gently. Centrifugal force tends to increase load radius. This increase in radius could overload the crane and cause crane damage or tipping. When stopping the swing, over swing of the load can side load the boom.
23. Keep the winch wire ropes as short as possible to prevent excessive swinging. Always use the shortest boom length which will do the job. Remember — the shorter the boom, the better the capacity.
24. Due to inertia (weight), a load will momentarily tend to stay in position when the crane starts to move. For this reason do not back the crane away from a suspended load when handling near capacity loads. The inertia effect will tend to increase load radius and decrease stability. Use hand lines as required to control the load.
25. Don't increase the counterweight. Don't add anything to the crane that will act as additional counterweight. Remember that anything which has weight, if carried behind the crane's center of gravity, acts as counterweight. Adding counterweight affects backward stability of the crane, particularly when working over the side. It also encourages overloading of the crane.
26. Working areas for cranes are defined per the Working Areas chart in the Crane Rating Manual. Permissible loads, per the Crane Rating Manual, will vary from lifting quadrant to lifting quadrant. The operator must ensure capacity ratings are not exceeded regardless of which quadrant he is operating in, or when swinging from one quadrant to another.
27. When working on tires, the tires must be inflated to pressures shown on the Tire Inflation Label on the carrier and/or the Tire Inflation Chart in the Crane Rating Manual.

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Traveling

1. Traveling with a suspended load should be avoided if possible. It is especially hazardous when terrain is rough or irregular, on a side slope, or in a hilly area. When traveling with a load, observe the following rules:
 - a. Use a hand line to control the load and reduce load swing.
 - b. Travel by the smoothest, most level route. If a smooth, level route is not available, don't travel with a suspended load. Grade the route to provide a smooth, level path. If it is not possible to grade the route, move the load by stepping. Level the crane on outriggers, lift the load and set it down ahead of the crane. Travel the unloaded crane beyond the load, level the crane on outriggers, lift the load, swing and set it down farther along the route. Continue this procedure until the load is at its destination.
 - c. Carry loads as close to the ground as possible.
 - d. Do not allow side swing of the load.
 - e. Don't attempt to carry loads which exceed the crane's rating. Refer to On Tires and Pick And Carry capacities shown in the Crane Rating Manual.
 - f. Don't travel with a load on soft ground. If the crane sinks into ground, stability can be affected to the point of tipping the crane.
 - g. Keep all personnel clear of crane and load. Be prepared to set load down quickly at any time.
 - h. Fully extend outrigger beams. Extend or retract jacks until pontoons just clear the ground.
 - i. Check clearance for the extra width of the crane with the outriggers extended. Outrigger beams or pontoons must not hang on any obstruction.
 - j. Inflate tires as shown on the Tire Inflation Label or in the Crane Rating Manual when making lifts on tires.
2. When traveling on the highway, road the crane safely. Watch for narrow bridges and low clearances. Check load limits, height, width, and length restrictions in the area you are traveling. Ensure the crane complies with all regulations.
3. When roading the crane, note the following:
 - a. Operate with lights on. Use proper warning signs, flags, and other devices. Use an escort service if required.
 - b. Engage travel swing lock. Release the 360° swing lock.
 - c. Lash down or otherwise restrain the hook block and/or hook ball.
 - d. Check for maximum allowable travel speed and any other travel limitations. Don't exceed these maximums. Crane damage or an accident could result.
 - e. Inflate tires as shown on the Tire Inflation Label when traveling on highway.
 - f. When traveling, outriggers must be fully retracted.
 - g. Remove all pontoons from the outrigger jacks and store them properly.
4. If the crane must be towed, refer to "Towing The Crane" in this Section of this Operator's Manual for specific instructions.

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Leaving The Operator's Cab

1. Do not get on or off a crane in motion. When climbing on the crane, remain in three point contact with the crane at all times (two hands and one foot or two feet and one hand). If a ladder is provided, use it.
2. Whenever an operator leaves the control station for any reason, the following must be done:
 - a. Lower the load to the ground.
 - b. Engage swing lock. Engage the park brake. Shutdown the engine and remove the keys.
 - c. Do not depend on a brake to suspend a load unless the operator is at the controls, alert and ready to handle the load. Brake slippage, vandalism, or mechanical malfunctions could cause the load to drop.
3. Do not leave crane unattended with engine running.
4. When changing work shifts, notify the next operator of any changes or problems with the crane.
5. Hydraulic cylinders, left extended under load, often-times have a tendency to drift in (retract) due to internal fluid passage in the cylinders and/or control valves. Do not shutdown the crane and leave it unattended for extended periods of time, i.e. overnight, with the boom positioned over anything or the crane itself that the boom could damage if it should lower. For instance the boom hoist cylinder may drift allowing the boom to lower and damage the engine hood. Position the boom over the front to avoid the engine hood on the rear of the crane.

Personnel Handling Guidelines

Introduction

The following information is intended to provide Link-Belt's recommended minimum requirements that must be followed when handling personnel with a personnel basket or work platform (hereafter referred to as a work platform) suspended by wire rope from the boom of Link-Belt cranes. These requirements are based upon several sources and are put forth in recognition of current industry practices. However, safety, when handling personnel, remains the full responsibility of job site management and is dependent upon the responsible action of every person on the job involved in the related work.

This information is intended to supplement and not to supersede or replace any more restrictive federal, state, or local regulations, safety codes, or insurance requirements. It is intended to serve users of personnel work platforms in achieving the following objectives.

1. Reduce risk of personal injuries to users and the public.
2. Inform users of their respective responsibilities.
3. Provide standards of equipment requirements.
4. Provide standards for tests and inspections.
5. Provide standards of operation to promote safety.

Link-Belt cranes are designed and intended for handling material. They are not normally equipped with secondary systems or other devices required by personnel lift or elevator standards and are not intended for handling personnel for construction or amusement purposes. Use of cranes for these purposes is hazardous and is not recommended by Link-Belt. However, Link-Belt understands that circumstances may occur (in construction work) when lifting or lowering personnel on a materials handling crane load line is the only or the least hazardous method available to position personnel. In fact, Occupational Safety and Health Administration (OSHA) Part 29, CFR 1926.1431 states "The use of equipment to hoist employees is prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions."

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Much corollary and supplementary information is contained within the following resource documents pertaining to both cranes and personnel work platforms. Job site management must ensure all requirements listed in these resource documents are followed for all personnel handling operations.

- American National Standards Institute Reference – ANSI Standards A10.28, A92.2, A92.3, and American Society of Mechanical Engineers – ASME, ANSI/ASME B30.5, and B30.23.
- Power Crane and Shovel Association (PCSA) Bureau of the Association of Equipment Manufacturers (AEM) Reference – PCSA Standard No. 4.
- American Petroleum Institute (A.P.I.) Specification 2C.
- OSHA Part 29, CFR 1926.1431 Cranes and Derricks.

Authorization

Authorized use of a work platform may be permitted only after the following on-site procedures have been performed:

1. A competent person on the job site (job site manager) specifically responsible for the overall work function to be performed has determined that there is no practical alternative means to perform the needed work and has authorized a personnel lifting operation.
2. For each instance of such lifting, a competent person responsible for the task has attested to the need for the operation by issuing a written statement describing the operation and its time frame and itemizing that each of the on-site authorization requirements has been met. The written statement, after being approved by a qualified person, shall be retained at the job site. (Refer to *Personnel Handling Pre-Lift Check List For Link-Belt Cranes* in this Section for a sample check list.)
3. Review of crane inspection records has been conducted to ensure the crane being used meets applicable provisions in ANSI/ASME B30.5 and B30.23.
4. Review of the work platform inspection records and specifications has been conducted to ensure it meets applicable design standards (refer to ANSI A10–28).
5. Review of the personnel lifting operation practices specified in these instructions have been conducted with job site managers and crane operator(s), foreman, designated signal person, personnel to be lifted, safety supervisor, and any other person(s) who has jurisdiction over the operation to ensure that they are aware of the hazards of the operation and they are aware of provisions of these instructions that must be adhered to before and during the personnel lifting operation.

Equipment

1. The crane system shall be equipped with the following:
 - a. A fully functional working operational aid such as a Rated Capacity Limiter (RCL) system – A system consisting of devices that sense crane loading, boom length (extendable booms only), boom angle, and also automatically provide an audible/visual signal when the loading conditions approach, reach, and/or exceed the rated capacity values. When the Actual Load exceeds the Rated Capacity, the system supplies a signal to a function cutout system. The operational aid shall be equipped with these additional devices:
 1. Anti-two block device to prevent damage to the hoist wire rope, other crane components, or attachments, and subsequent endangerment of personnel.
 - It is required that the anti-two block device warn both audibly and visually as well as have the capability to cutout the controls/functions that may cause a two block condition.
 2. Boom angle indicator.
 - Cranes with extendable booms must utilize a boom angle indicator having “high and low” set points and audible/visual alarm(s) capable of activating function cutouts.
 - b. Boom hoist and load line shall have power lowering and raising and shall have an automatic brake which is applied when the applicable control is in neutral, or when the anti-two block device is actuated.
 - c. If the crane is equipped with a “free-fall” hoist, steps shall be taken to ensure its use is not possible during the use of the work platform. (Note: A.P.I. applications do not permit the crane to be equipped with free-fall.)
 - d. Each crane shall have a mechanical swing park brake or swing lock capable of being set at any swing position, and shall have a variable swing brake or swing controls capable of stopping the upper swing motion smoothly. The swing brake must be properly maintained at all times to ensure its holding capability.

Note: All operational aids and equipment must be maintained in operable condition. Alternative measures are not permitted.

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2. The work platform shall be designed by a qualified engineer competent in structural design. Its maintenance, and its attachment to the crane load line, is the responsibility of the job site management. Their arrangement shall comply with the following as a minimum:
 - a. The work platform harness must be of sufficient length to prevent any portion of the work platform or the harness from coming in contact with the boom at any working boom angle.
 - b. Audible and visual alert systems shall be provided to the personnel in the work platform to signal for assistance in the event of an emergency.
 - c. Hooks on hook block assemblies, hook ball assemblies, or other assemblies, shall be of a type that can be closed and locked, (with a working safety latch) eliminating the hook throat opening, and shall be full load-bearing, and contain a manual trigger release.
3. No unauthorized alterations or modifications are allowed to be made to the basic crane.
4. Any structural or functional defect which adversely affects the safe operation of the lift crane shall be corrected before any operation utilizing a work platform begins or continues.
5. The hoist drum shall have at least three full wraps of wire rope remaining on the drum at all times when using a work platform.
6. Minimum load hoist and boom hoist wire rope design factors for the combined weight of the lift attachments, work platform personnel, and tools shall be 10:1 for "Non-Rotating" and "Rotation Resistant" wire ropes. All other wire rope types require a 7:1 design factor. (Note: A.P.I. applications require 10:1 design factor for all wire rope construction.)
7. The work platform shall be suspended from a wire rope that is reeved from an allowed lifting sheave. Refer to "Lifting Sheaves For Personnel Handling With Suspended Work Platforms" chart to determine the allowed sheave(s).
8. Inspect the wire ropes, sheaves, hoist drum brakes, and other mechanical and rigging equipment vital to the safe operation of the crane.
9. Ensure that all wire rope sockets and dead end lugs are properly installed and are in good working condition.
10. Ensure that all wire rope guards are in good working order and that they are properly installed and adjusted to prevent wire rope from jumping off sheaves.
11. Inspect all structural members of all boom sections, fly sections, luffing jib sections, and live mast, as equipped.
12. In addition to other regular inspections, visual inspection of the crane and work platform shall be conducted immediately after testing and prior to lifting personnel. The following inspections shall be conducted on extendable booms prior to lifting personnel:
 - a. Full power style booms:
 1. Inspection of all extension wire ropes at the access points in the boom where the end connections are visible — Refer to the Operator's Manual for inspection and adjustment procedures.
 - b. Pinning and latching style booms:
 1. Inspection of the latching mechanism, sensors, and hydraulic/electrical circuit at the access points.
 2. Inspection of all pins and pinning locations in the individual boom sections and at the fully retracted position.
 3. Verification of the accuracy of the boom length indicator. Refer to the Operator's Manual for the procedures.

Maintenance, Lubrication, And Adjustments

1. The crane operator must have a complete understanding of the crane's maintenance, lubrication, and adjustment instructions as outlined in the Operator's Manual.
2. The crane shall be maintained, lubricated, and adjusted, by a designated person, as specified in the Operator's Manual.
3. The crane and work platform decals must be understood and maintained.
4. All decal precautions and instructions shall be strictly observed.

Inspection And Rigging

1. The lift crane and work platform shall be inspected immediately prior to commencement of operation. (Refer to the Crane Operator's Manual and ANSI B30.5, Section 5, Section 5—2.1.2 and 5.2.4, and ANSI/ASME B30.23 for the required inspection procedures for the crane. Refer to ANSI A10.28 for inspection procedures required for the work platform.)
2. The inspection shall be performed once daily when the crane is being used in work platform service or each time the crane is converted from material lifting to personnel handling operation. In the event the operator is replaced, a new inspection is required. Written documentation of all inspections must be kept on the job site during personnel handling operations.
3. Inspect the crane and work platform for any loose, damaged, or missing components.

13. The following inspections shall be conducted on fixed length style booms prior to lifting personnel:
 - a. Inspection of all pendants, pendant links, pendant spreader bars, links, etc.
 - b. Inspection of all mechanical linkages, shafts, drums, etc.
14. A written record of all the above inspections must be maintained on the job site.

Crane Test Procedures

The test procedures listed below shall be conducted at the following intervals:

- Daily,
- At each job site before hoisting employees,
- After any repairs or modifications to the equipment,
- When an operator is replaced, and
- When, in the judgement of responsible job site management, or controlling entity, there has been a significant change in the conditions of the personnel lifting operation.

Note: No personnel are allowed to ride the work platform during any of the tests recommended in this Section.

1. The work platform and rigging shall be proof tested to 125 percent of the work platform's rated capacity. (The proof test may be done concurrently with the trial lift by completing the following test procedures.) Do not exceed the rated lifting capacity of the applicable lift crane as listed on the crane capacity charts. (Refer to ANSI A10.28 for suspended work platform testing and inspection.)
 - a. This test load shall be tested for stability.
 - The operator and signal person shall conduct this test.
 - This test shall include movement of the work platform through its entire intended range of motion, simulating the specific operation to be undertaken.
 - A successful stability test must not produce instability of the crane or cause permanent deformation of any component.

- b. This test load shall be raised and lowered at maximum power controlled line speed (NOT FREE-FALL). The acceleration must be smooth and the deceleration capability of the control/braking system shall be confirmed by bringing the work platform to a smooth stop. The work platform shall be held in a suspended position for a minimum of five minutes with the test load evenly distributed on the work platform. (This experience is intended to sharpen the skill of the operator in handling the work platform and to give the operator an opportunity to evaluate the crane's performance.) The work platform shall then be inspected for any evident sign of damage or defect.
2. All limiting and warning devices shall be tested by activation of each appropriate control function.
3. With pinning and latching style extendable booms, a visual inspection shall be conducted to verify that the boom extend pins are properly set in the extended boom sections.
4. At the beginning of each lift, the work platform must be hoisted a few inches (*mm*) with the personnel and materials/tools on board and inspected by a competent person to ensure;
 - The work platform is secure and properly balanced,
 - All wire ropes are free of deficiencies such as kinking, crushing, corrosion, etc.,
 - Any multiple part lines are not twisted,
 - The primary attachment is centered over the work platform, and
 - If any load rope is slack, it must be inspected to ensure that all ropes are properly seated on the drum and in the sheaves.
5. Any condition found during any of these tests/inspections that fails to meet requirements or may create a safety hazard, must be corrected before hoisting personnel.

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Telescopic Booms		Main Boom Head Sheaves	Auxiliary Head Sheaves	Fixed Fly Sheave
		Allowed	Allowed	Allowed
		Offset Fly Sheave	Offset Fly With Extension(s) Sheave	A—Frame Jib Sheave
		Allowed	Allowed	Not Recommended
Conventional Lattice Tubular or Angle Booms		Main Boom Head Sheaves	Tip Extension Sheaves	Jib Head Sheave
		Allowed	Allowed	Allowed
Luffing Attachments	Luffing Boom Auxiliary Head Sheaves	Midfall Sheaves	Luffing Jib Head Sheaves	Fixed Jib Head Sheave
	Not Recommended	Allowed	Allowed	Not Recommended
Lifting Sheaves For Personnel Handling With Suspended Work Platforms				

Operation And Safety

- The Operator's Manual for the crane shall be read and fully understood by operating personnel. The Crane Operator's Manual shall be available to them at all times.
- Safety when handling personnel remains the full responsibility of job site management and is dependent upon the responsible action of every person on the job involved in the related work.
- Mobile lift cranes shall be erected to obtain maximum crane stability. The crane must be level and on firm ground. It is recommended that the outriggers be fully extended and the tires must be clear of the ground before beginning any operation.
- The operator shall not leave the operator's station when the work platform is occupied. The operator shall remain alert in a position of readiness at the work station with the engine running and the master clutch engaged, if crane is so equipped.
- Unauthorized personnel shall not be in the operator's cab on the lift crane, or near the lift crane while a work platform is suspended from the load line.
- Any operation in which a work platform is to be suspended from the load line shall be carefully planned by the operator, supervisory personnel, designated signal person, and personnel to be lifted prior to commencement of such operation. They are to be advised:
 - That the crane does not have safety devices normally used on personnel handling equipment.
 - That the safety of the operation depends on the skill and judgment of the crane operator and others present.
 - Of procedures to enter and leave the work platform and other safety procedures.
- After positioning of the work platform:
 - All brakes and locks on the lift crane shall be set before personnel perform any work.
 - With pinning and latching style extendable booms, a visual inspection shall be conducted to verify that the boom extend pins are properly set in the extended boom sections.
- Telescope operation is not recommended with any extendable boom with personnel in a suspended work platform.
- A work platform attached to load line of lift cranes shall not be used for working on any energized electric power line, or any energized device or facility used for electric power generation or transmission. Minimum working clearance shall be at least twice that recommended for material handling operations in ANSI B30.5b section 503.4.5 and ANSI B30.23.
- The combined weight of the work platform, any attachment device, personnel, tools, and other equipment shall not exceed 50% of the lifting capacity of the applicable lift crane as listed on the crane capacity chart. (Note: A.P.I. applications require 25% of lifting capacity as the limit.)
- Use caution when utilizing pendant supported lattice jibs on tubular or angle booms as the jib can drift backwards into the jib backstops under certain conditions. This is most likely with short jib lengths with minimum jib offset and maximum boom angle. Pay special attention to detect the possibility of jib drift during the work platform test lift. An additional test lift is recommended with an empty work platform when operation at or near these conditions.
- The following actions and operations are strictly prohibited when working with personnel suspended in a work platform:

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- a. Cranes shall not travel while personnel are in the work platform.
- b. No lifts shall be made on another of the crane's load lines with personnel suspended in a work platform.
- c. No external load is allowed to be lifted by attaching it to the work platform.
- d. Work platform lifts shall be a single crane operation. A work platform shall not be lifted using two cranes.
- e. Hoisting of personnel shall be discontinued upon indication of any dangerous weather conditions, wind, or other impending danger.
- f. The emergency manual mode operation of pinning and latching style extendable booms shall not be utilized.
- g. Free-fall (if equipped) shall not be used.
13. Movement of the work platform with personnel shall be done in a slow, controlled, cautious manner with no sudden movements of the crane or work platform. Do not use high speed functions, if equipped.
14. Do not use multi-function crane operation. If load hoist, boom hoist, and swing functions must be used to position the work platform, perform each function individually.
15. Clear, unobstructed visibility between personnel on the work platform and the crane operator shall be maintained at all times except where a designated signal person has been assigned and positioned such that he is visible to both. Such designated signal person shall have no other duties to perform when personnel are in the work platform.
16. Voice communication between work platform personnel, the crane operator, and designated signal person, if assigned, shall be maintained.
17. If other cranes or equipment may interfere with the lifting of personnel, signals or other means of communication between all crane or equipment operators shall be maintained to avoid interference with individual operations.
18. If the work platform is not landed, it shall be tied to a structure before personnel mount or dismount the work platform.
19. Personnel in the work platform shall wear personal fall arrest systems. Anchors used for attachment of personal fall arrest equipment shall be independent of any anchors being used to support or suspend work platforms. Personnel shall keep all parts of body, tools, and equipment inside work platform during raising, lowering, and positioning.
20. Personnel shall always stand firmly on the floor of the work platform and shall not sit or climb on the edge of the work platform or use planks, ladders,

or other devices for attaining a work position. (This does not apply to offshore personnel transfer baskets. Personnel must ride on the exterior of this type of personnel handling device to assure greater safety of the operation.)

21. When welding is done by personnel in the work platform, the electrode holders shall be protected from contact with metal components of the work platform. If electrically connected electrode holders contact work platform, work platform could be dropped due to burning/melting of wire ropes suspending the work platform.
22. A pre-lift meeting must be conducted with the crane operator, signal person, employee(s) to be hoisted, person responsible for the task to be performed, and anyone else that is directly involved with the lift (as applicable) to review all the requirements and procedures that must be followed to complete the lift.
23. Follow all procedures for determining the rated capacity and perform all testing as outlined in the Crane Operator's Manual, the Crane Rating Manual, and this Safety Manual.

Additional Requirements For Offshore Cranes

1. Link-Belt offshore cranes are designed to handle materials. However, due to the special conditions commonly existing offshore, the use of cranes to transfer personnel between vessels or from a vessel to a work platform is an established practice. The safety of the personnel, if a materials handling crane is used in transferring personnel, depends upon the skill and judgment of the crane operator and alertness of the personnel being transferred. Sea and weather conditions may create additional hazards beyond the skill of persons involved.

This operation is approved by the American Petroleum Institute (A.P.I.). By adopting procedures for this operation, the institute has determined that the transfer of personnel may be performed safely under certain offshore conditions. Therefore, whenever an offshore crane is used to transfer personnel, all persons involved in the operation must know and implement the A.P.I. procedures and verify that sea and weather conditions are within safe limits for the transfer.

In addition to all previous requirements in these Instructions, A.P.I. 2C requires the following:

- Boom and load hoists used shall be approved by the hoist manufacturer for personnel handling and shall be so indicated on their name plate.
- Refer to A.P.I. 2C Section 6 for further details and procedures.

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Personnel Handling Pre-Lift Check List for Link-Belt Cranes



1	<p>I am the designated person responsible for verifying that all safety requirements are met for this personnel handling operation;</p> <p>Name: _____ Title: _____</p> <p>Signature: _____ Date: ____/____/____ Initials</p>	
2	I have verified that there are no conventional means to handle personnel for this operation.	
3	I have a written statement authorizing personnel handling from a competent person on the job who accepts full responsibility, or I accept full responsibility for the operation.	
4	The Crane Operator acknowledges that he has read and fully understands the Crane Operator's Manual and Crane Rating Manual. All personnel involved have been informed and understand the tasks required to complete the personnel lifting operation.	
5	The crane has been maintained, lubricated, and adjusted by a designated person, as specified in the Crane Operator's Manual.	
6	<p>The lift crane is equipped, and all devices operate properly as follows:</p> <ul style="list-style-type: none"> • Anti-two block device with hydraulic cutouts • Power load raising and lowering with automatic brakes and function cutouts – Free-Fall (if equipped) shall not be used • Boom angle indicator with high and low set points and function cutouts • Boom length indicator (telescopic booms only) and function cutouts • Load Indicating System or Rated Capacity Limiter System • A variable swing brake or swing controls capable of stopping upper swing motion smoothly • A mechanical swing park brake or swing lock to hold the upper in position while personnel are working from the work platform • Hook block or hook ball being used can be closed and locked with a safety latch 	
7	A working audible and visual alert system is provided to the personnel in the work platform.	
8	A mechanical and structural crane inspection has been completed by a designated person.	
9	The wire rope used to lift the work platform is reeved from an allowed lifting sheave	
10	Crane travel is not allowed with personnel in the work platform.	
11	Telescoping the boom is not recommended with personnel in the work platform.	
12	When handling personnel with pinning and latching style booms, it is recommended boom be kept in a pinned position. Inspections must be made to ensure boom extend pins are set.	
13	All wire rope sockets and dead end lugs are properly installed and are in good working condition. All Wire rope guards are properly installed and adjusted to hold all ropes on the appropriate sheaves.	
14	Voice communications between the Crane Operator and the personnel in the work platform are present and operational.	
15	Fall arrest systems are present and in use by personnel in the work platform.	
16	Weather and wind conditions are acceptable to safely perform the lift.	
17	A Proof-Test/Trial Lift was completed with 125% of the work platform's rated capacity.	
18	The total load being lifted will not exceed 50% of the standard lift crane capacity charts.	
19	Cranes with outriggers have them equally extended with tires clear of the ground.	
20	A Pre-Lift meeting was held with all appropriate personnel to review all aspects of the lift.	

Note: This checklist is to be used as a supplement to (not a substitute for) the information and procedures supplied for personnel handling operations.

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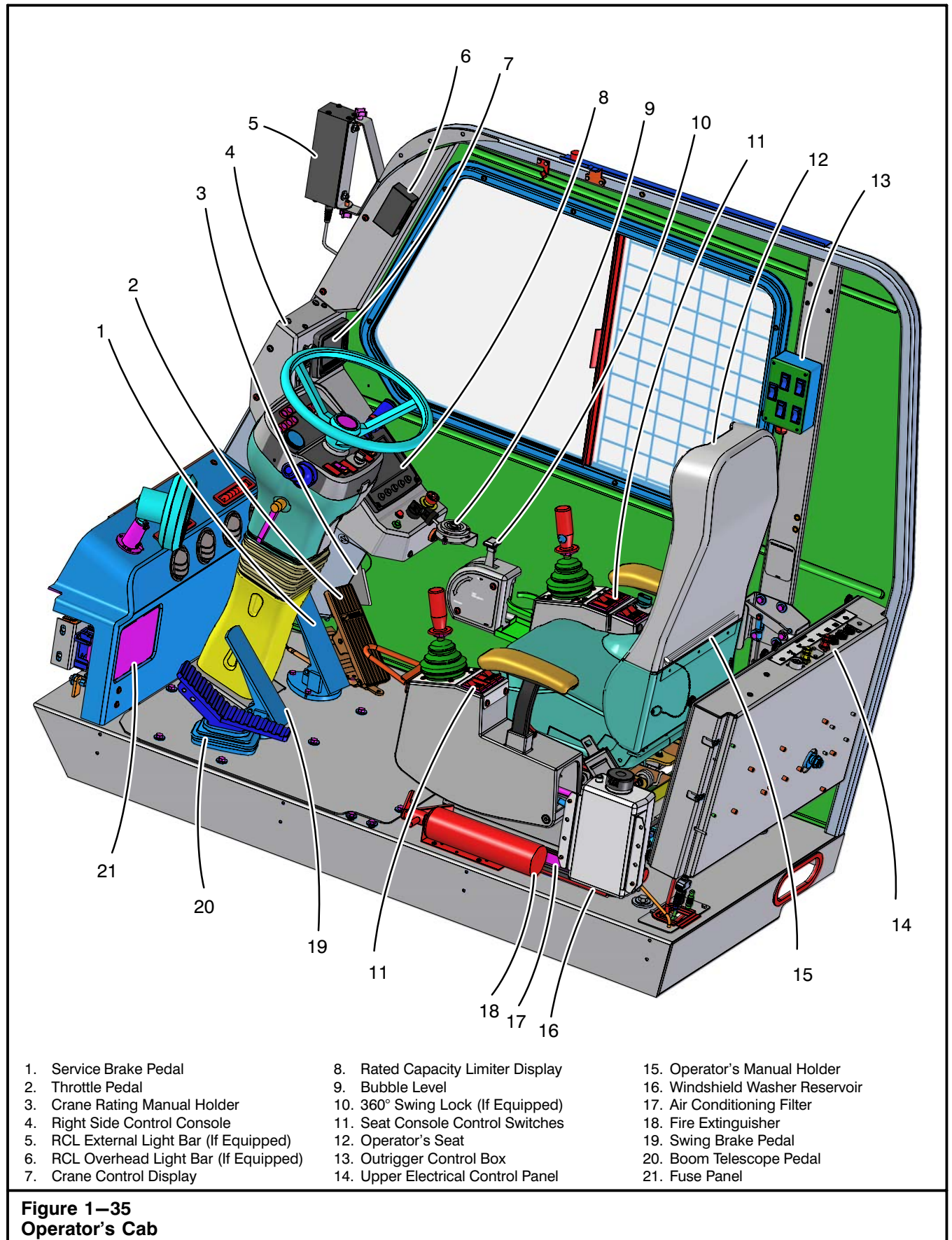
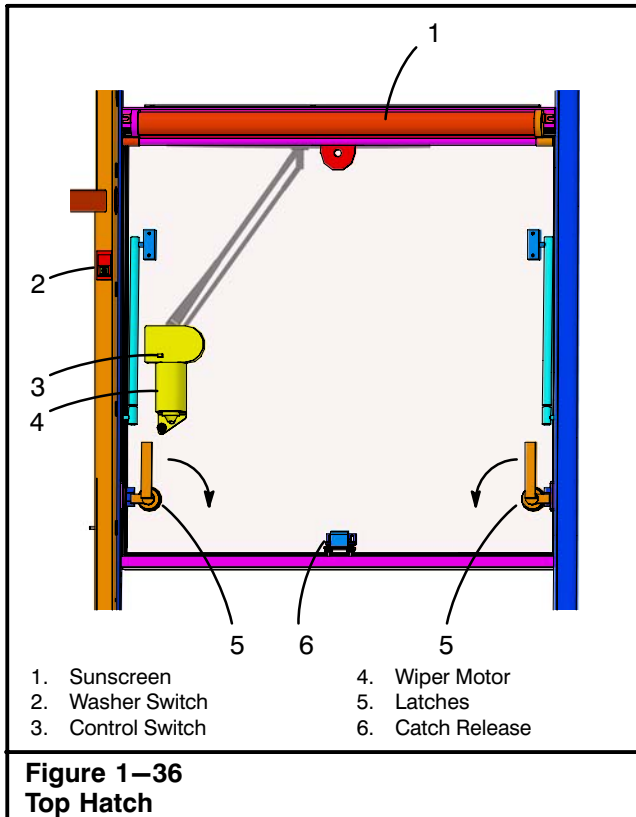


Figure 1–35
Operator's Cab

Operator's Manual



Operator's Cab

Several panels which contain the controls, switches, and gauges are mounted throughout the operator's cab to operate and monitor crane operations. Refer to Figure 1—35. The following is a description of each control, switch, or gauge in each panel, along with an explanation of their function and/or operation.

Fire Extinguisher

A fire extinguisher is mounted in the operator's cab below the left console. Raise the left console to gain access to the extinguisher. It is an A B C type fire extinguisher, meaning it is capable of extinguishing most types of fires. The operator should be familiar with its location, the clamp mechanism used to secure it in

place, and foremost the operation of the device. Specific instructions, regarding operation, are given on the label attached on the fire extinguisher. A charge indicator on the fire extinguisher monitors the pressure within the tank. Check the indicator daily to ensure the fire extinguisher is adequately charged and ready for use.

Top Hatch

Top Hatch Wiper And Washer

The top hatch wiper is mounted in the top right corner of the operator's cab roof. Refer to Figure 1—36. The switch for the top hatch wiper is on the wiper motor. Move the switch to the "ON" or "OFF" position as desired. To wash the window, push the washer switch to spray washer fluid on the top hatch window.

Top Hatch Window

The top hatch window can be opened to improve the operator's cab ventilation. To open the top hatch window, rotate the latches, press the catch release, and push up on the hatch window.

Top Hatch Sunscreen

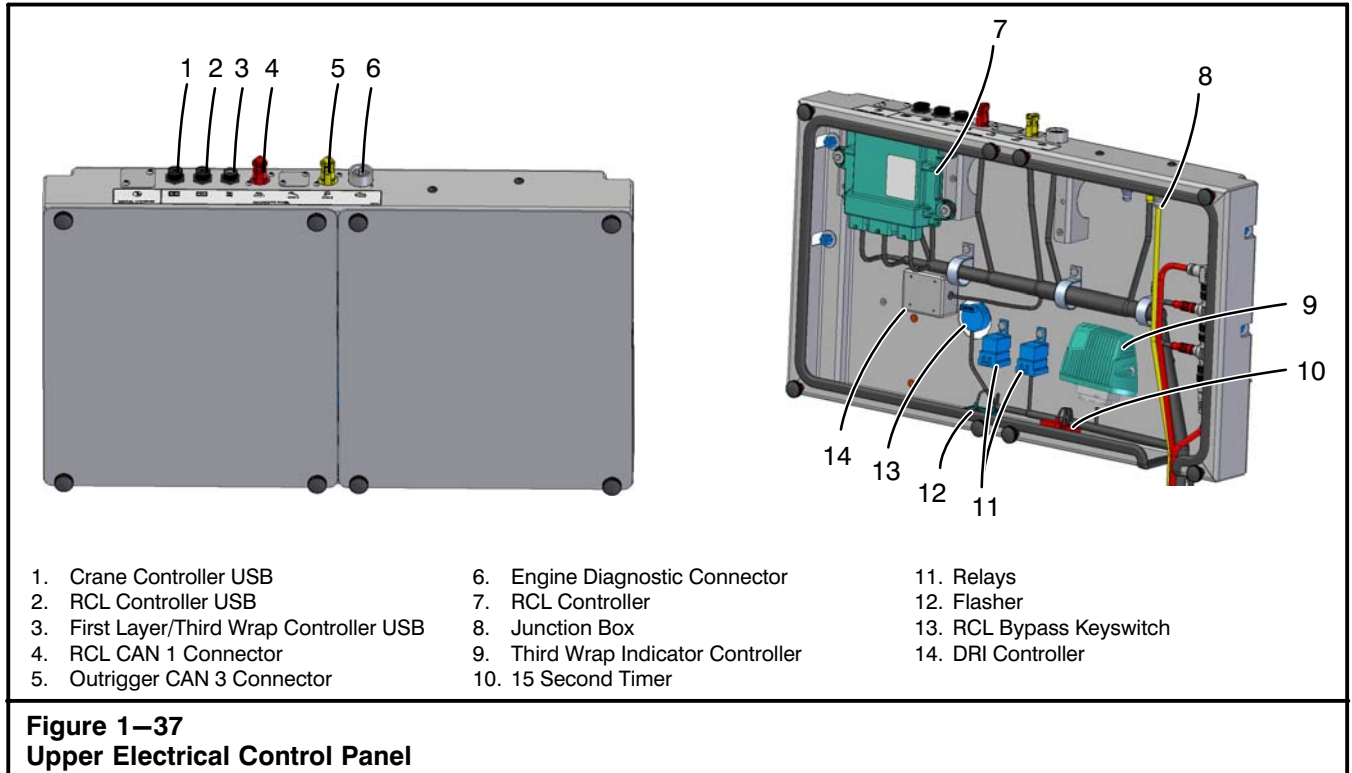
The top hatch is equipped with a roller sunscreen for better operator vision when looking up through the top hatch.

Windshield Washer Reservoir

Check the windshield washer reservoir daily. The reservoir for washer fluid is mounted in the lower left rear of the operator's cab. Refer to Figure 1—35. Visual inspection can determine if the washer fluid is adequate. Do not operate the washer when the reservoir is empty. Use specially formulated windshield washer fluid rather than water because specialty washer fluids contain additives that dissolve road grime.

Bubble Level

The bubble level is provided to assist the operator in leveling the crane on outriggers. It is mounted on the right operator's cab wall. Refer to Figure 1—35.

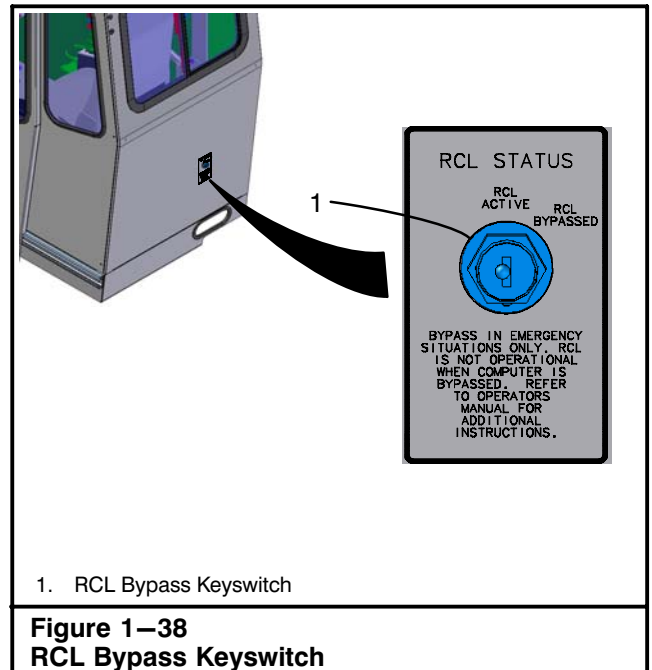


Upper Electrical Control Panel

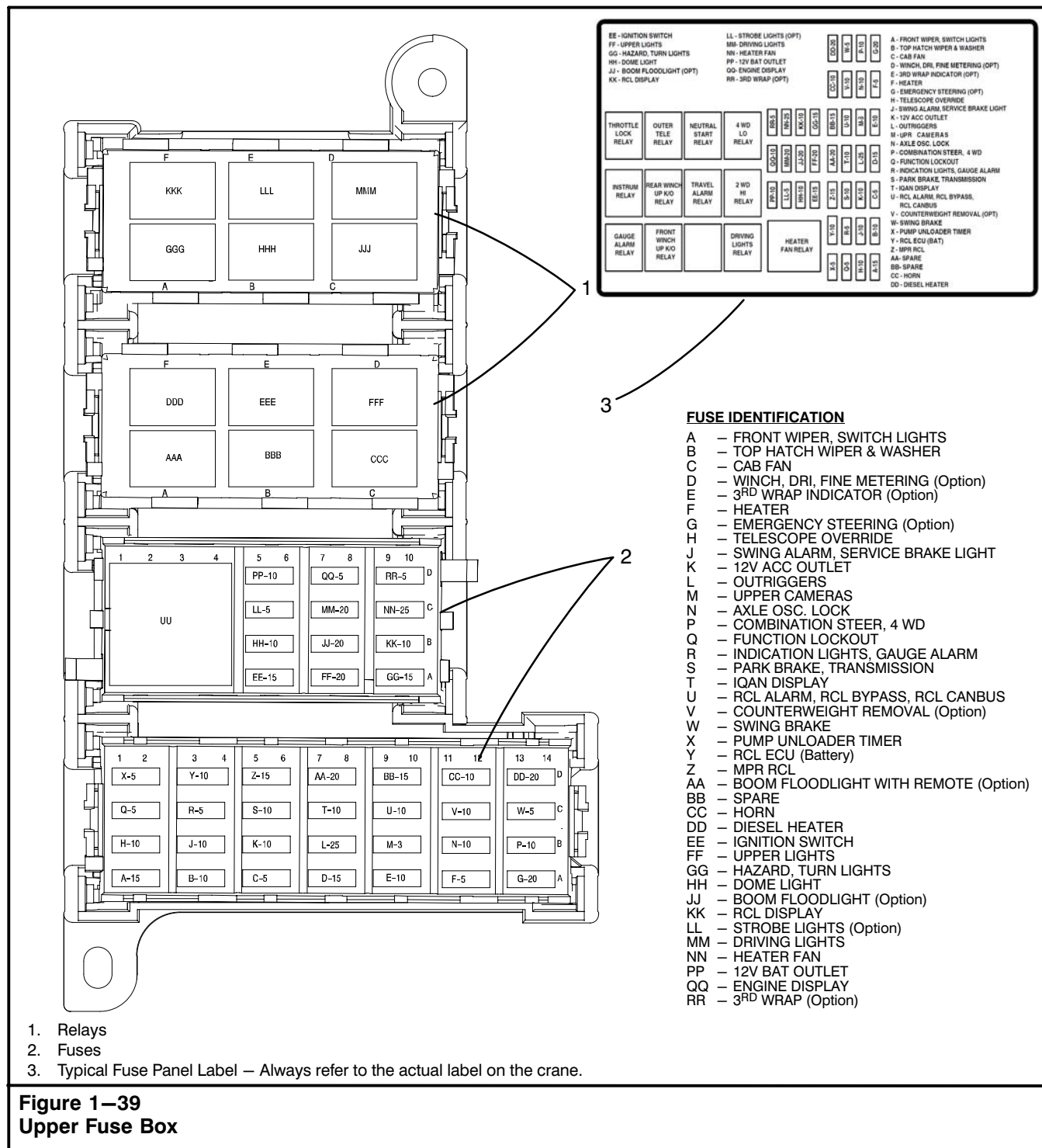
The Upper Electrical Control Panel is mounted behind the operator's seat. Refer to Figure 1–35 and Figure 1–37. The central location allows easy access for technicians to retrieve fault codes and conduct systematic troubleshooting of various upper control systems. A label which identifies each connector is on the back of the panel.

RCL Bypass Keyswitch

The RCL Bypass Keyswitch is in the upper electrical control panel and can be accessed from the rear of the operator's cab. Refer to Figure 1–37 and Figure 1–38. The RCL bypass keyswitch is used to bypass the Rated Capacity Limiter computer in emergency situations. Refer to "Crane Monitoring System" in this Section of this Operator's Manual.



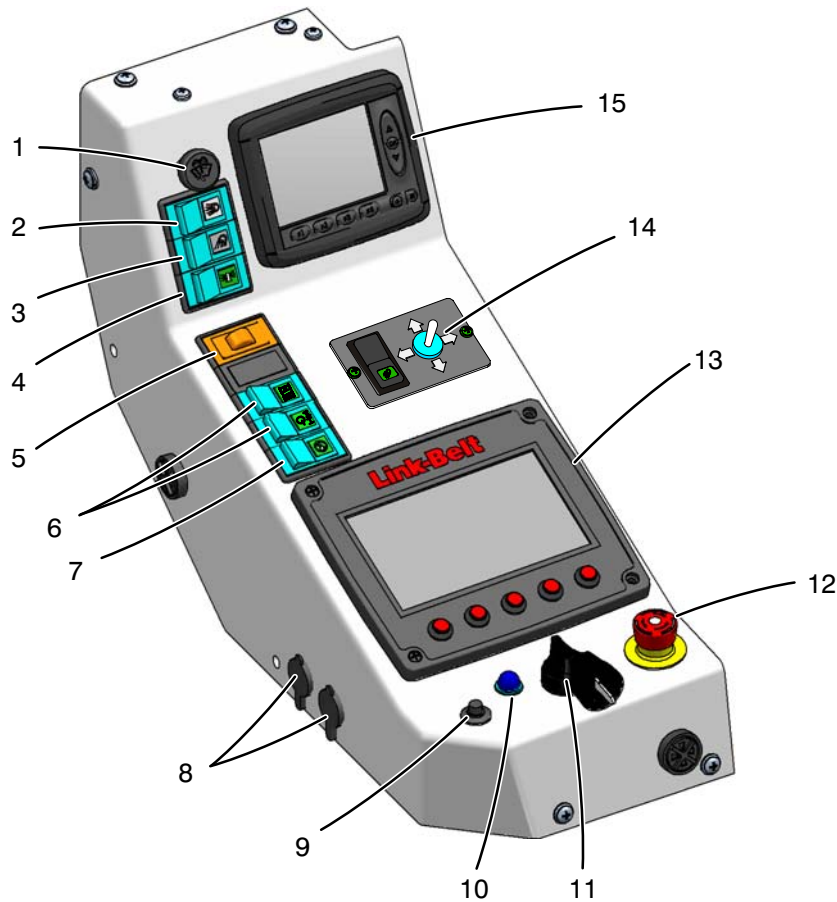
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Upper Fuse Box

The upper fuse box is behind the fuse panel in the operator's cab. Refer to Figure 1–35 and Figure 1–39. Remove the fuse panel to gain access to the fuses. A label

which designates the upper electrical circuit protected by each fuse is on the back of the fuse panel. Each fuse has a letter designation which corresponds to the upper electrical system as shown on the fuse identification label. Use the fuse puller provided to replace a fuse.



- | | | |
|---|--|---|
| 1. Windshield Wiper/Washer Switch | 6. First Layer/Third Wrap Calibration Switches (If Equipped) | 11. Engine Ignition Switch |
| 2. Upper Lights Switch | 7. Function Lockout Switch | 12. Engine Emergency Shutdown Button |
| 3. Boom Floodlight Switch (If Equipped) | 8. 12V DC Accessory Outlets | 13. Rated Capacity Limiter Display |
| 4. Rotating Beacon or Strobe Light Switch (If Equipped) | 9. Horn Button | 14. Remote Boom Floodlight Controls (If Equipped) |
| 5. Gauge Lights Dimmer Switch | 10. Key ON Indicator | 15. Crane Control Display |

Figure 1—40
Right Side Control Console

Right Side Control Console

A control panel is in the right front corner of the operator's cab that contains the following controls, gauges, and indicators. Refer to Figure 1—40.

1. Windshield Wiper/Washer Switch



Rotate the wiper/washer knob clockwise to activate the windshield wiper. Rotate the knob to the first detent for low speed wiper or to the second detent for high speed wiper. Rotate the knob counterclockwise to turn the wiper off. Pushing the knob sprays washer fluid on the windshield to clean the window.

2. Upper Lights Switch



This switch operates upper lights. Push the right side of the switch to turn lights on, left side to turn them off.

3. Boom Floodlight Switch (If Equipped)



This switch operates the boom floodlight. Push the right side of the switch to turn floodlight on, left side to turn it off.

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4. Rotating Beacon or Strobe Light Switch (If Equipped)

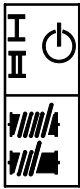


This switch controls the operator's cab rotating beacon or strobe light. Push the right side of the switch to turn it on, left side to turn it off.

5. Gauge Lights Dimmer Switch

This switch is used to control the dash lights. Rotate the switch to dim or brighten the dash lights.

6. First Layer/Third Wrap Calibration Switches (If Equipped)



These switches are used to calibrate the first layer/third wrap warning system. When the winch wire rope is down to the first layer on the drum(s), an audible alarm will sound intermittently, and "First Layer" will appear in the warning message area on the RCL

Display to alert the operator that the wire rope is down to the first layer on the winch drum(s). When the wire rope is down to the third wrap on the winch drum(s), an audible alarm will sound continuously, and "Third Wrap" will appear in warning message area on the RCL Display. If enabled and activated, the winch function will also cutout with the third wrap alarm. Refer to First Layer/Third Wrap Calibration in Section 3 of this Operator's Manual for calibration procedures.

7. Function Lockout Switch



This switch is used to disable hydraulic functions which are operated by the control levers and boom telescope foot pedal.

Press the right side of the switch to disable hydraulic functions and to prevent inadvertent operation of these controls. To allow normal operation of the control levers and boom telescope foot pedal, press the left side of the switch. The right side of the switch will illuminate to indicate the switch is in the ON position.

8. 12V DC Accessory Outlets

Use these outlets for electrical accessories.

CAUTION

Do not connect an accessory to any part of the crane other than the accessory outlets or cigarette lighter. Major damage to the crane's electrical system may result. If it is necessary to do so, contact your Link-Belt Distributor.

9. Horn Button



Press this button to sound the horn. Before starting the engine, it is recommended to sound the horn twice in succession and wait 10–15 seconds while making a visual check to verify that there are no persons under or in close proximity to the crane. There also is a horn button on the right control lever and on the turn signal lever.

10. Key On Indicator

This indicator will illuminate to alert the operator that the ignition key is in the ON position.

11. Engine Ignition Switch

The engine ignition switch is the conventional, key operated, automotive type. It controls engine off/on/start, accessories, and energizes the instrument panel in the operator's cab.

12. Engine Emergency Shutdown Button



The engine emergency shutdown button is used to shutdown the engine in emergency situations. Press the button to shutdown the engine. Reset the button by turning it counterclockwise.

13. Rated Capacity Limiter (RCL) Display

This displays the boom length, boom angle, load weight, etc. Refer to "Crane Monitoring System" in this Section of this Operator's Manual for complete operating instructions.

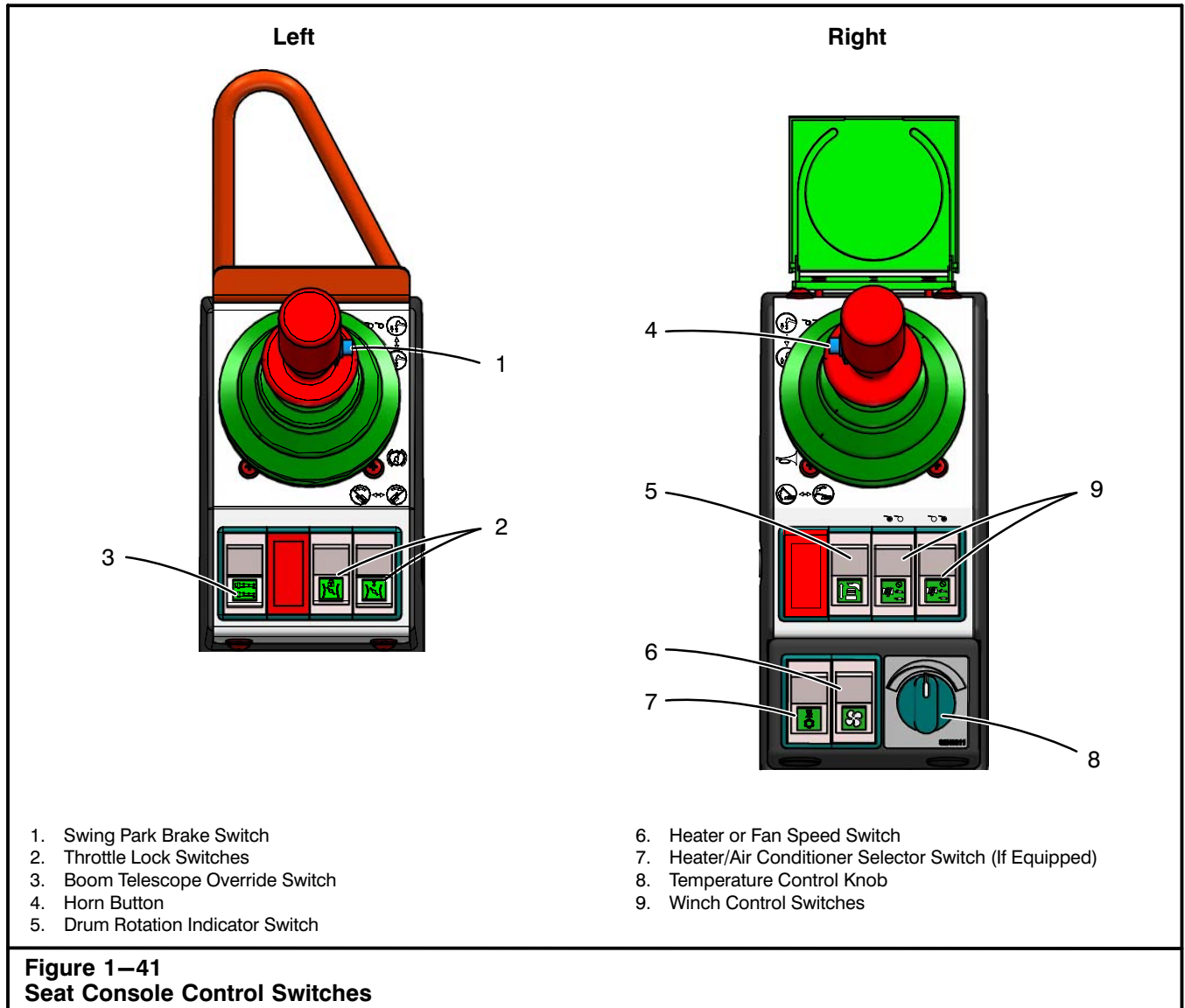
14. Remote Boom Floodlight Controls (If Equipped)



Use the rocker switch to operate the boom floodlight. Push the top part of the switch to turn floodlight on, bottom part to turn it off. Use the directional control to move the floodlight up, down, left, or right.

15. Crane Control Display

The Crane Control Display will display various carrier engine data such as rpm's, coolant temperature, fuel level, etc. Refer to "Crane Control Display" in this Section of this Operator's Manual for operating instructions.



Seat Console Control Switches

Control switches are on the left and right consoles of the operator's seat. Refer to Figure 1—35 and Figure 1—41.

1. Swing Park Brake Switch



This switch is used to operate the swing park brake to hold the upper in any position over the carrier. The Swing Park Brake Indicator Light on the Crane Control Display will illuminate to indicate the swing park brake is applied. Refer to "Swing System" in this Section of this Operator's Manual for complete operating procedures.

2. Throttle Lock Switches



These switches are used to hold the engine at a constant speed. This provides the operator with more flexibility for certain job requirements. Refer to "Throttle Lock System" in this Section of this Operator's Manual.



3. Boom Telescope Override Switch



This switch is provided to manually override the telescope system when the boom is not extending/retracting proportionally in boom mode "STD". Use this switch for that purpose only. While in boom mode "STD", press the top part of the switch to stop the outer and tip sections or the bottom part to stop the inner section so the boom can be extended/retracted proportionally.

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4. Horn Button



Press this button to sound the horn. Before starting the engine, it is recommended to sound the horn twice in succession and wait 10–15 seconds while making a visual check to verify that there are no persons under or in close proximity to the crane. There also is a horn button on the right side control console and on the turn signal lever.

5. Drum Rotation Indicator Switch



This switch is used to activate the drum rotation indicator system. To activate the system, press the bottom part of the switch. Press the top part of the switch to deactivate the system. The bottom part of the switch will illuminate to indicate switch is in the ON position. Refer to “Drum Rotation Indicators” in this Section of this Operator's Manual for complete operating procedures.

6. Heater or Fan Speed Switch



This switch controls the operator's cab heater if the operator's cab is not equipped with air conditioning. Press the top part of the switch to turn the unit on, bottom part to turn it off. If the operator's cab is equipped with air conditioning, this switch controls the fan speed.

7. Heater/Air Conditioner Selector Switch (If Equipped)



If the operator's cab is equipped with air conditioning and heater, this switch selects which system to operate. Press the top part of the switch to turn the heater on, bottom part to turn the air conditioning on.

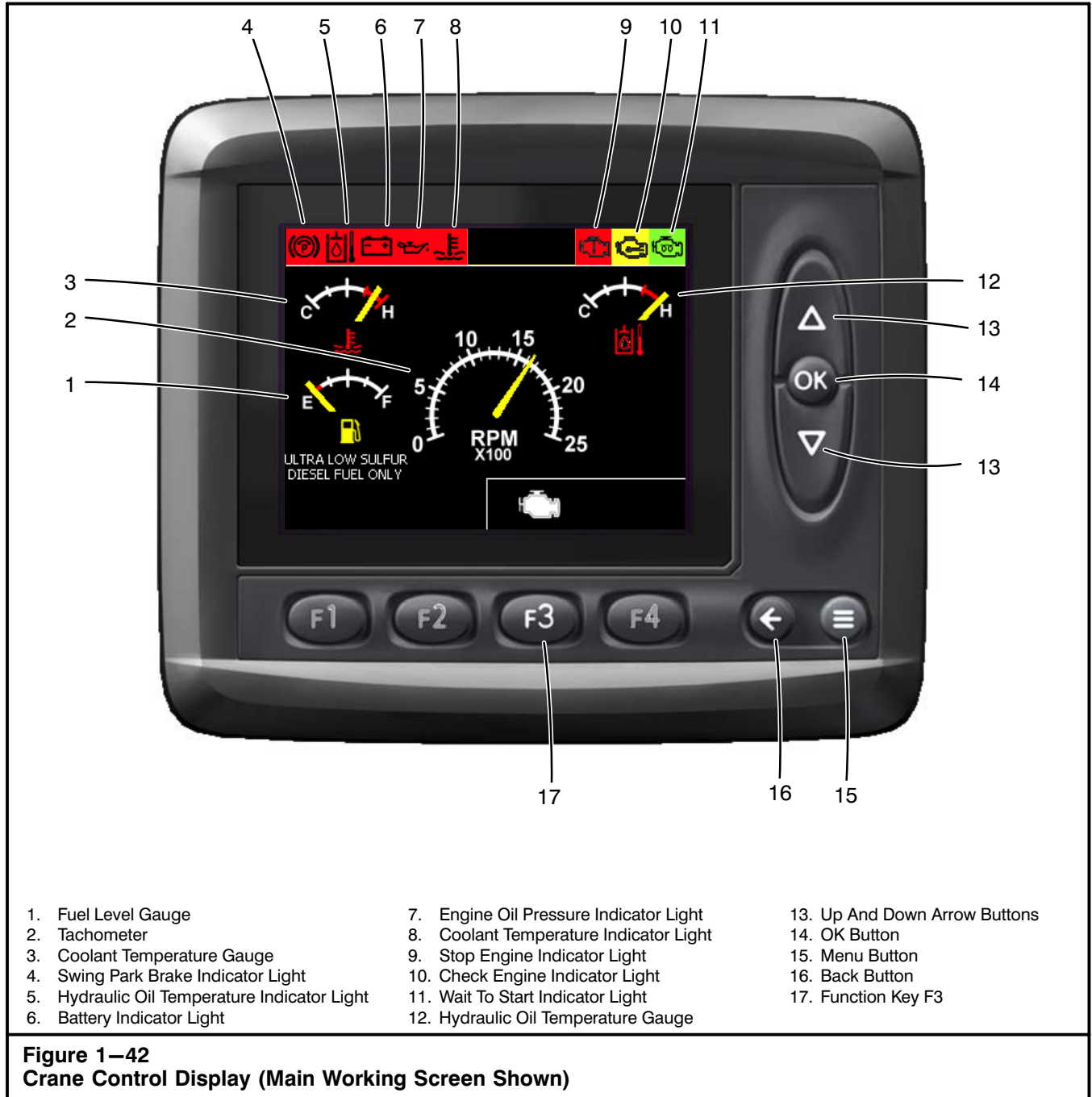
8. Temperature Control Knob

Turn the temperature control knob to adjust the temperature in the operator's cab.

9. Winch Control Switches



These switches are used to control engaging/disengaging the high speed hoist and disabling the front and/or rear winch. Refer to “Wire Rope Winch System” in this Section of this Operator's Manual for complete operating procedures.



Crane Control Display

The Crane Control Display contains the following controls, gauges, and indicators and is on the right side control panel. Refer to Figure 1—40 and Figure 1—42.

1. Fuel Level Gauge



This gauge registers the level of fuel in the fuel tank. The fuel tank capacity is 110 gal (416L). Refer to the engine manufacturer's manual for the correct grade of diesel fuel. When the fuel level reaches an eighth of a tank, the indicator light within the gauge will change from white to yellow.

2. Tachometer



The tachometer registers engine speed in revolutions per minute (rpm). Refer to the engine manufacturer's manual for suggested operating speeds.

3. Coolant Temperature Gauge



This gauge registers the engine cooling system temperature. For proper cooling system operating temperature range, refer to the engine manufacturer's manual. If the cooling system overheats, reduce engine speed until the

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temperature returns to normal operating range. If engine temperature does not return to normal temperature, shutdown the engine and refer to engine manufacturer's manual. When the coolant temperature exceeds normal operating range an indicator light will illuminate, an alarm buzzer will sound, and the stop engine indicator light may illuminate. Also the indicator light within the gauge will change from white to red.

4. Swing Park Brake Indicator Light



This light will illuminate anytime the swing park brake is applied and the ignition is on.

5. Hydraulic Oil Temperature Indicator Light



This red indicator light will illuminate along with an alarm buzzer to alert the operator that the hydraulic oil exceeds the maximum operating temperature. If the system overheats, shutdown the crane immediately and correct the problem.

6. Battery Indicator Light



This red indicator light will illuminate along with an alarm buzzer to alert the operator that the charge or the voltage in the battery is not within normal operating range.

7. Engine Oil Pressure Indicator Light



This red indicator light will illuminate along with an alarm buzzer to alert the operator that the engine oil pressure is not within normal operating range. For proper oil pressure operating range, refer to the engine manufacturer's manual. If there is no engine oil pressure after 10–15 seconds of running time, shutdown the engine immediately and repair the problem to avoid engine damage.

8. Coolant Temperature Indicator Light



This red indicator light will illuminate along with an alarm buzzer to alert the operator that the engine cooling system temperature exceeds the maximum operating temperature. For proper cooling system operating temperature range, refer to the engine manufacturer's manual. If the cooling system overheats, reduce engine speed until the temperature returns to normal operating range. If engine temperature does not return to normal temperature, shutdown the engine and refer to engine manufacturer's manual. When the coolant temperature exceeds normal operating range, the stop engine indicator light may also illuminate.

9. Stop Engine Indicator Light



This red indicator light will illuminate along with an alarm buzzer and an error message pop-up screen to alert the operator of major engine problems. When this light illuminates stop operations immediately and shutdown the engine. Refer to the engine manufacturer's manual and determine the problem before any further operation of the engine.

10. Check Engine Indicator Light



This yellow indicator light will illuminate along with an error message pop-up screen to make the operator aware of minor engine problems. When this light illuminates engine operation may continue. However, refer to the engine manufacturer's manual and determine the problem as soon as possible to avoid prolonged operation of the malfunctioning engine which could develop into a major problem.

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11. Wait To Start Indicator Light



This green indicator light will illuminate in cold weather when the ignition switch is in the "ON" position to alert the operator not to crank the engine. During cold weather conditions the light illuminates and an engine air intake heater will activate to heat the air before entering the engine air intake. When the air intake is warm enough the indicator light will go out and then the engine can be started. This aids in engine start-up in cold weather conditions and reduces white smoke after starting. For additional information refer to "Cold Engine Starting" in this Section of this Operator's Manual.

12. Hydraulic Oil Temperature Gauge



This gauge registers the hydraulic oil temperature in the main return line. Normal operating ranges vary with the oils used in different climates. Refer to Section 2 of this Operator's Manual for proper oil viscosities and operating temperature ranges. If the hydraulic oil exceeds the maximum operating temperature, the hydraulic oil temperature indicator light will illuminate and an alarm buzzer will sound. Also the indicator light within the gauge will change from white to red. If the system overheats, shutdown the crane immediately and correct the problem.

13. Up And Down Arrow Buttons



These are navigation buttons that are used to scroll through selections on a menu page.

14. OK Button



Pushing this button equals "enter", saves the value, or confirms the selection.

15. Menu Button



Push this button to bring up a menu page.

16. Back Button





Push this button to return to the previous display page.

17. Function Key F3



This Function Key will bring up the fine engine data and aftertreatment control screen. Refer to "Engine Data Screen" in this Section of this Operator's Manual.

Engine Data Screen

The engine data screen can be displayed by pressing the Function Key F3 () from the main working screen. The display will now show the engine data screen. Press the back button () to return to the previous screen. The following describes the data displayed on the engine screen.

1. Fuel Consumption



This displays the actual fuel consumption in gallons per hour (gal/hr).

2. Engine RPM



This displays the actual engine speed in revolutions per minute (rpm). Refer to the engine manufacturer's manual for suggested operating speeds.

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1. Fuel Consumption
2. Engine RPM
3. Engine Oil Temperature

4. Engine Coolant Temperature
5. Battery Voltage Output
6. Engine Load

Figure 1-43
Engine Data Screen

3. Engine Oil Temperature



This displays the actual engine oil temperature in degrees Fahrenheit (°F). For proper oil temperature operating range, refer to the engine manufacturer's manual.

4. Engine Coolant Temperature



This displays the actual engine cooling system temperature in degrees Fahrenheit (°F). For proper cooling system operating temperature range, refer to the engine manufacturer's manual.

5. Battery Voltage Output



This displays the actual voltage output from the battery in volts (V).

6. Engine Load



This displays the actual engine load as a percentage (%).

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Crane Control Display Brightness Adjustment



1. From the main working screen, press the menu button.



4. Press the Function Key F2 to select Backlight.



2. Press the Function Key F3 to bring up the Preferences screen.



5. Press the Up/Down Arrow buttons to adjust the display brightness.
6. Press the Function Key F1 to return to the main working screen.



3. Press the Function Key F1 to bring up the Display screen.

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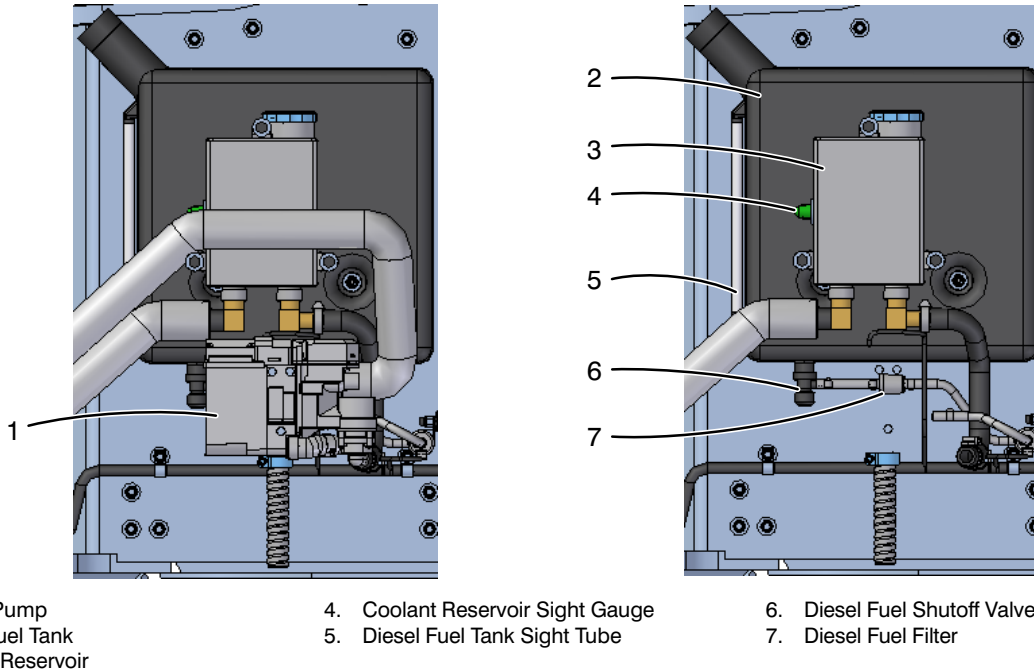


Figure 1-44
Diesel Fired Warm-water Operator's Cab Heater

Operator's Cab Heater Operation


This crane may be equipped with a diesel fired warm-water operator's cab heater or an optional engine dependant warm-water operator's cab heater. Refer to the following instructions to operate the operator's cab heater that is used on the crane.

Diesel Fired Warm-water Operator's Cab Heater

This operator's cab heater uses anti-freeze circulating through the unit to provide heat. Anti-freeze is stored in a reservoir mounted on the left side of the upper frame. This anti-freeze is heated by a diesel fired heater/pump and circulated through the heat exchanger in the operator's cab. The diesel fuel tank, for the system, is mounted on the left side of the upper frame. Refer to Figure 1-44. Diesel fuel should be #1, #2, or arctic. The fuel system is equipped with an inline filter and should be changed every 2,000 hours of operation or annually, whichever occurs first. The anti-freeze used should be the same type used in the crane's engine. Refer to engine manufacturer's manual for proper anti-freeze selection.

Note: Operate the heater at least once a month for 10 minutes to keep all components in best working order.

Note: To improve heater performance when operating the crane in prolonged ambient temperatures below -7°C (20°F), kerosene is the recommended fuel.



WARNING

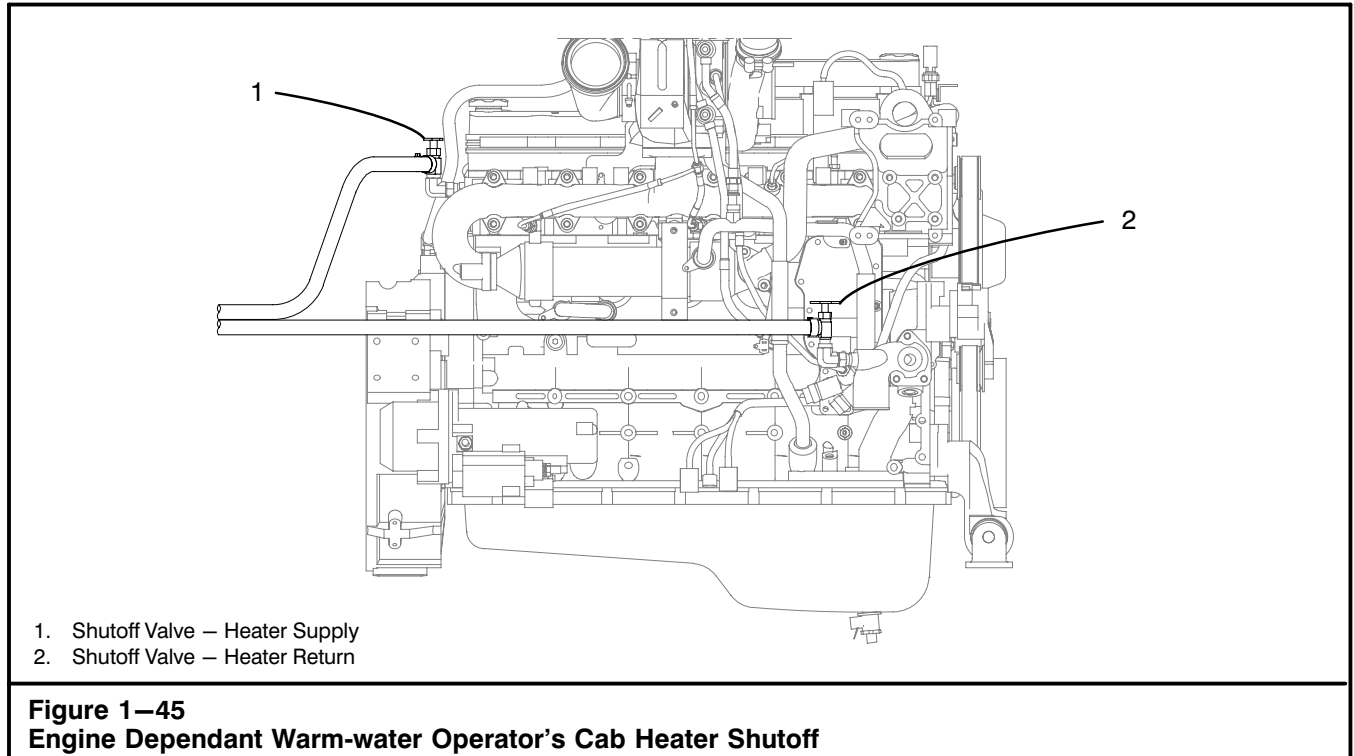
Diesel exhaust fumes can be harmful. Start and operate diesel operator's cab heater in a well ventilated area. If it is necessary to operate in an enclosed area, vent the exhaust to the outside.

To Start The Diesel Fired Warm-water Operator's Cab Heater

1. Before activating the heater, ensure that the diesel fuel tank and the coolant reservoir are to proper levels.
2. With the engine running, press the heater switch or if crane is equipped with air conditioning, press the top part of the heater/air conditioner selector switch to turn the heater on. Refer to Figure 1-41.
3. Turn temperature control knob to the desired setting.
4. If the operator's cab is equipped with air conditioning, use the fan speed switch to control the air flow into the operator's cab. If the operator's cab is not equipped with air conditioning, use the heater/fan speed switch to control the air flow into the operator's cab.

To Stop The Diesel Fired Warm-water Operator's Cab Heater

1. Press the heater switch to the off position.
2. During warm weather conditions or if the heater is not going to be used for an extended period of time, rotate the temperature control knob to the coolest setting.



Engine Dependant Warm-water Operator's Cab Heater (If Equipped)

This operator's cab heater uses engine coolant circulating through the unit to provide heat. Normally the engine coolant circulates through the heater in the operator's cab regardless of whether the heater switch is turned on or not. During warm weather conditions, the operator may wish to shutoff the flow of hot engine coolant to the heater to reduce the temperature in the operator's cab. Shutoff valves are on the engine to perform this function. Refer to Figure 1—45.

To Start The Operator's Cab Heater

1. With the engine running, press the heater switch or if crane is equipped with air conditioning, press the top part of the heater/air conditioner selector switch to turn the heater on. Refer to Figure 1—41.
2. Turn the temperature control knob to the desired setting.
3. If the operator's cab is equipped with air conditioning, use the fan speed switch to control the air flow into the operator's cab. If the operator's cab is not equipped with air conditioning, use the heater/fan speed switch to control the air flow into the operator's cab.

To Stop The Operator's Cab Heater

1. Press the heater switch to the off position.
2. During warm weather conditions or if the heater is not going to be used for an extended period of time, rotate the temperature control knob to the coolest setting.

Operator's Cab Heater Shutoff (If Equipped)



WARNING

Shutdown the engine and allow it to cool before operating the heater shutoff valves. The valves may be hot and could cause serious burns.

1. Shutdown the engine and rotate the handles on the shutoff valves clockwise to stop the flow of engine coolant to the heater; Counterclockwise to restore it. Refer to Figure 1—45.

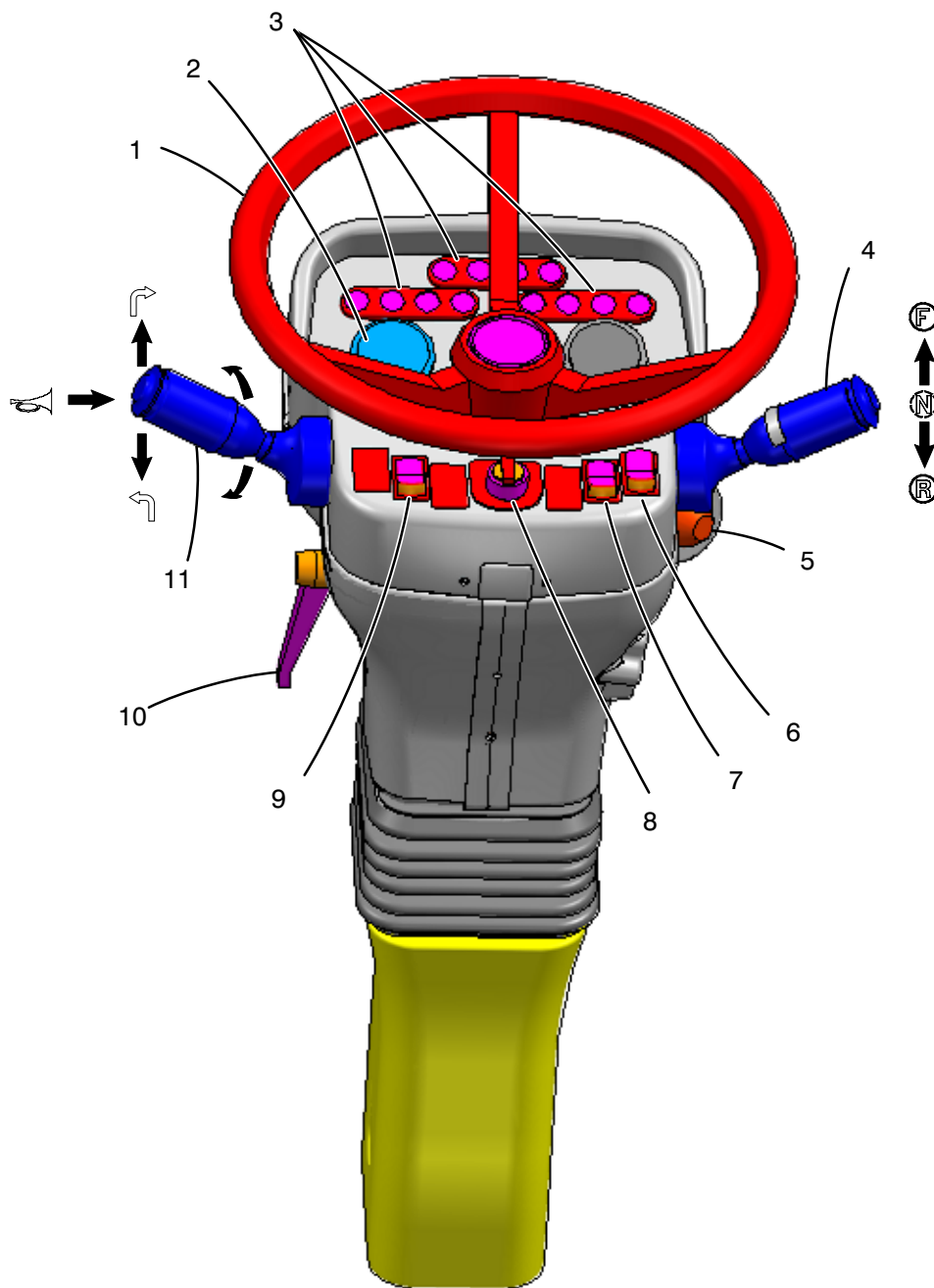
Air Conditioning (If Equipped)

The operator's cab may be equipped with an air conditioning unit. Use the following instructions to operate the unit. Refer to Figure 1—41.

Note: The air conditioner can be used to aid in defogging and defrosting the windshield. It also will aid in removing humidity and moisture from the cab.

1. Start the engine and allow all operating temperatures and pressures to reach their normal range.
2. Press the bottom part of the heater/air conditioner selector switch to activate the air conditioning unit.
3. Press the fan speed switch to control the amount of air blown into the operator's cab.
4. Turn temperature control knob to the desired setting.
5. To turn the unit off, press the heater/air conditioner selector switch to the off position.

Operator's Manual



- | | | |
|---------------------------------------|--------------------------------|---|
| 1. Steering Wheel | 5. Emergency Hazard Switch | 9. Travel Park Brake Switch |
| 2. Transmission Oil Temperature Gauge | 6. Transmission Gear Switch | 10. Tilt/Telescoping Column Lever |
| 3. Indicator Light Bars | 7. 4-Wheel Drive/Range Switch | 11. Turn Signal/Horn/Driving Lights Lever |
| 4. Transmission Shift Lever | 8. Combination Steering Switch | |

Figure 1—46
Steering Column And Wheel

Steering Column And Wheel

The following is a description of the controls on the steering column along with an explanation of their function and/or operation. Refer to Figure 1–46.

1. Steering Wheel

Turn the steering wheel clockwise for right turns and counterclockwise for left turns.

Note: Relative direction of the steering wheel is based on the position of the upper over the carrier.

2. Transmission Oil Temperature Gauge



This gauge registers the oil temperature in the transmission torque converter. Normal operating temperature range is 180–210°F (82–98°C). When the oil temperature exceeds normal operating range an indicator light within the gauge will illuminate and an alarm buzzer will sound. If the oil overheats, discontinue operation, shift the transmission to neutral, and run the engine at 1,000–1,200 rpm (do not stop the engine if the cooling system is known to be in working order). Transmission oil temperature should soon lower. Always change the oil and filter after the transmission oil has overheated. Refer to Section 2 of this Operator's Manual for the correct oil change procedure.

3. Indicator Light Bars

Three indicator light bars are on the steering column and contain the following indicator lights:



Left Turn Signal — This light will blink to indicate that the left turn signal is on or the hazard lights are flashing.



Engine Oil Pressure — This indicator light will illuminate when the engine oil pressure is not within normal operating range. If there is no engine oil pressure after 10–15 seconds of running time, shutdown the engine immediately and repair the problem to avoid engine damage.



Rear Wheel Offset — This indicator light will illuminate to alert the operator that the rear wheels are out of line with the carrier. Refer to "Combination Steering" in this Section of this Operator's Manual for complete operating procedures.



Emergency Steer — On cranes equipped with emergency steer, this light alerts the operator that power steering pump pressure is low. When the emergency steering indicator light illuminates, there is enough oil in storage to negotiate approximately eight 90° turns. Park the crane and shutdown the engine if this indicator light illuminates. Discontinue further operations until the problem is resolved.



Travel Park Brake Engaged — This light will illuminate anytime the travel park brake is engaged and the ignition is on.



Service Brake Warning — This light will illuminate to warn the operator of an imminent service brake failure. When this light illuminates, approximately twelve service brake applications can be obtained prior to complete brake system failure. When this light illuminates discontinue operations immediately, park the crane, and correct the problem before placing the crane back into service.



Right Turn Signal — This light will blink to indicate that the right turn signal is on or the hazard lights are flashing.

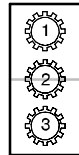
4. Transmission Shift Lever

The transmission shift lever is used to select the forward or reverse gear in the transmission. To put the transmission in forward or reverse gear, the lever is pushed up then pushed forward to engage the forward gears, or pulled backward to engage the reverse gears.

5. Emergency Hazard Switch

This switch controls the emergency hazard flashers. Push the switch to turn flashers on, push the switch again to turn them off.

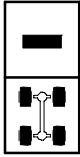
6. Transmission Gear Switch



This switch is used to shift the transmission. Press the top part of the switch for first gear, middle position for second gear, and bottom part of the switch for third gear.

Operator's Manual

7. 4-Wheel Drive/Range Switch



This switch is used to select either the 2-Wheel drive mode or 4-Wheel drive mode for the carrier power train by engaging or disengaging the front drive axle. This switch also simultaneously selects either high or low range speeds for the transmission. When the switch is in the “4-WHEEL DRIVE” mode the transmission is in the low speed range. When the switch is in the “2-WHEEL DRIVE” mode the transmission is in the high speed range. Bring the crane to a complete stop and shift the transmission to neutral before changing the position of the 4-Wheel Drive Switch. The top part of the switch will illuminate to alert the operator that 4-Wheel drive mode has been engaged.

8. Combination Steering Switch

The crane is equipped with four different modes of steering in order to provide maximum maneuverability on the job site. Refer to “Combination Steering” in this Section of this Operator's Manual for complete operating procedures.

9. Travel Park Brake Switch



This switch controls engaging and releasing the travel park brake.



WARNING

Do not use the travel park brake to stop the crane in motion (as a service brake) except in cases of extreme emergency. Application cannot be controlled.

To Engage The Travel Park Brake

- Bring the crane to a complete stop by applying the carrier service brakes.
- Shift the transmission to neutral.
- Move travel park brake switch to “ON” position.
- Travel park brake indicator light should illuminate.

To Release The Travel Park Brake

- Apply the carrier service brakes.
- Move the travel park brake switch to the “OFF” position.
- The travel park brake indicator light should go out.

10. Tilt/Telescoping Column Lever

This lever controls the tilt (angle) and telescoping function of the steering column.

To change steering column height and angle:

- Bring the crane to a complete stop.
- Shift the transmission to neutral and engage the travel park brake.
- Rotate the tilt/telescoping column lever.
- Position the steering wheel at the desired height and angle and rotate lever to lock it in place.
- Check all steering wheel functions before continuing operation.

11. Turn Signal/Horn/Driving Lights Lever

Turn Signal — Pull the lever down for left turn signal, push up on lever for right turn signal.

Horn — Push the end of the lever to sound the horn. There is also a horn on the right side console and on the right control lever.

Driving Lights — Rotate the lever to the first detent ☀ to illuminate the parking lights, the second detent ☞ for headlights. Rotate the lever to the off ● position to turn all lights off.

Transmission Controls

The transmission controls are mounted on the steering column. Refer to Figure 1—46. The transmission shift lever controls all functions of the powershift transmission. The transmission contains three forward and three reverse high range speeds in 2-Wheel drive mode and three forward and three reverse low range speeds in 4-Wheel drive mode. See “Traveling The Crane” in this Section of this Operator's Manual for necessary preparations before traveling the crane.

Shifting The Transmission

1. Engage the travel park brake and place shift lever in neutral position. Start the engine. (Engine will start only when transmission is in neutral.) Allow the transmission oil temperature to reach normal operating range.
2. Engage travel swing lock and release the swing park brake and the 360° swing lock, if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock engaged during pick and carry operations or when traveling or transporting the crane. Use the travel swing lock. Failure to release the swing park brake and 360° swing lock during these operations may result in damage to the swing mechanism.

3. Forward Travel
 - a. With crane at a complete stop, apply the carrier service brakes, shift the transmission to neutral, and release the travel park brake.
 - b. Move transmission shift lever to the “F” position.

Note: Relative direction of the crane is based on the position of the upper over the carrier.

- c. Slowly release the service brake pedal while using the throttle pedal to increase the engine speed allowing the crane to accelerate.
 - d. At full engine speed, press the transmission gear switch to shift to the next gear. Repeat to shift through the desired gears.

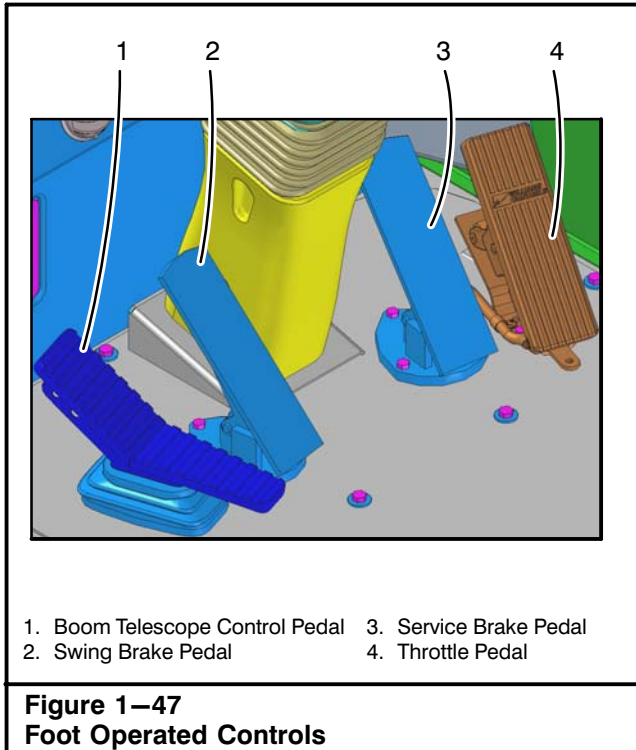
4. Reverse Travel
 - a. With crane at a complete stop, apply the carrier service brakes, shift the transmission to neutral, and release the travel park brake.
 - b. Move transmission shift lever to the “R” position.

Note: Relative direction of the crane is based on the position of the upper over the carrier.

The travel/back-up alarm will sound anytime the transmission is shifted into reverse. It will also sound anytime the transmission is shifted out of neutral and the upper is not positioned directly over the front of the carrier.

- c. Slowly release the service brake pedal while using the throttle pedal to increase the engine speed allowing the crane to accelerate.
 - d. At full engine speed, press the transmission gear switch to shift to the next gear. Repeat to shift through the desired gears.

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Foot Operated Controls

The following is a description of the foot controls in the operator's cab along with an explanation of their function and/or operation. Refer to Figure 1—47.

1. Boom Telescope Control Pedal

Depress the toe of the pedal to extend the boom. Depress the heel to retract the boom. Refer to "Boom Telescope System" in this Section of this Operator's Manual for complete operating instructions.

2. Swing Brake Pedal

The swing brake pedal is used to stop rotation of the upper over the carrier. Refer to "Swing System" in this Section of this Operator's Manual for complete operating instructions.

3. Service Brake Pedal

The carrier service brakes are controlled by the service brake pedal. Press the pedal down to apply the service brakes. Release the pedal to release the carrier service brakes.

The distance the service brake pedal is moved determines the braking force. Depress the pedal fully only in cases of emergency as this makes control of the crane difficult.

4. Throttle Pedal

Engine speed is controlled by the throttle pedal. Press the throttle pedal down to increase engine speed. Release the throttle pedal to decrease engine speed.

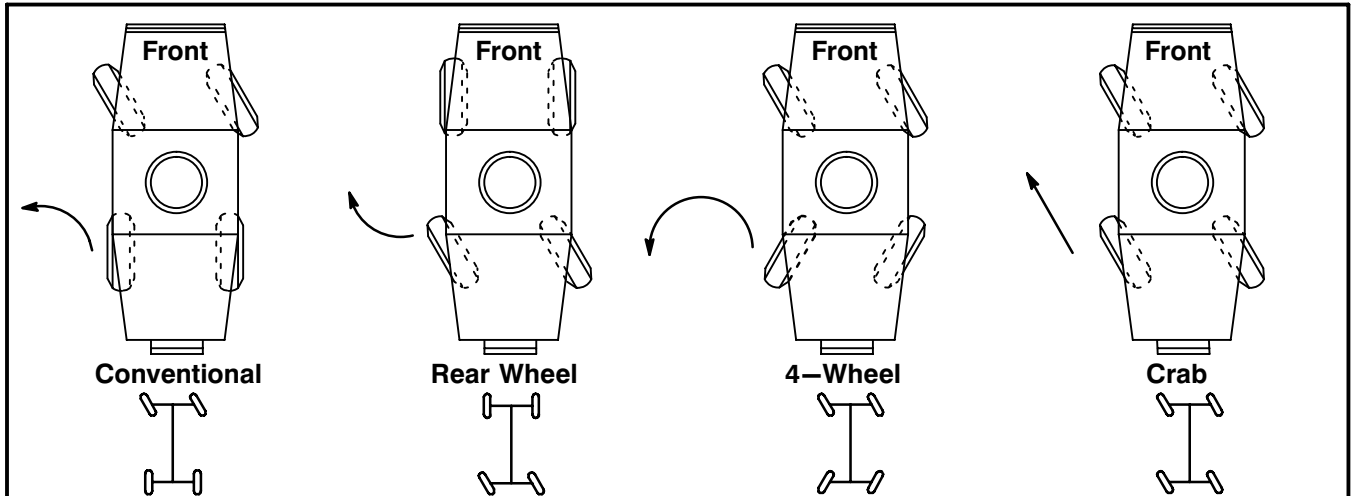


Figure 1-48
Steering Modes

Combination Steering

The crane is equipped with four different modes of steering in order to provide maximum maneuverability on the job site: Conventional, Rear Wheel, 4-Wheel, and Crab Steer. Each steer mode provides slightly different maneuverability to meet job site requirements. Refer to Figure 1-48 for illustration of the different steer modes.

Conventional Steer Mode

This steer mode is similar to that of an automobile. In this steer mode, the front wheels may be turned in either direction and the rear wheels remain stationary. Use this steer mode for all extended or high speed travel.



WARNING

Do not use Rear Wheel, 4-Wheel, or Crab Steer mode for extended or high speed travel as steering behavior may be unfamiliar and a loss of crane control could occur.

Rear Wheel Steer Mode

This steer mode is similar to that of a fork truck. In this steer mode, the rear wheels may be turned in either direction and the front wheels remain stationary. Use this steer mode for job site travel only; not for extended or high speed travel.

4-Wheel Steer Mode

This steer mode allows steering with all four wheels. The front wheels turn in one direction and the rear

wheels turn in the opposite direction. This results in a greatly reduced turning radius that allows extra maneuverability in certain job site conditions. Use this steer mode for job site travel only; not for extended or high speed travel.

Crab Steer Mode

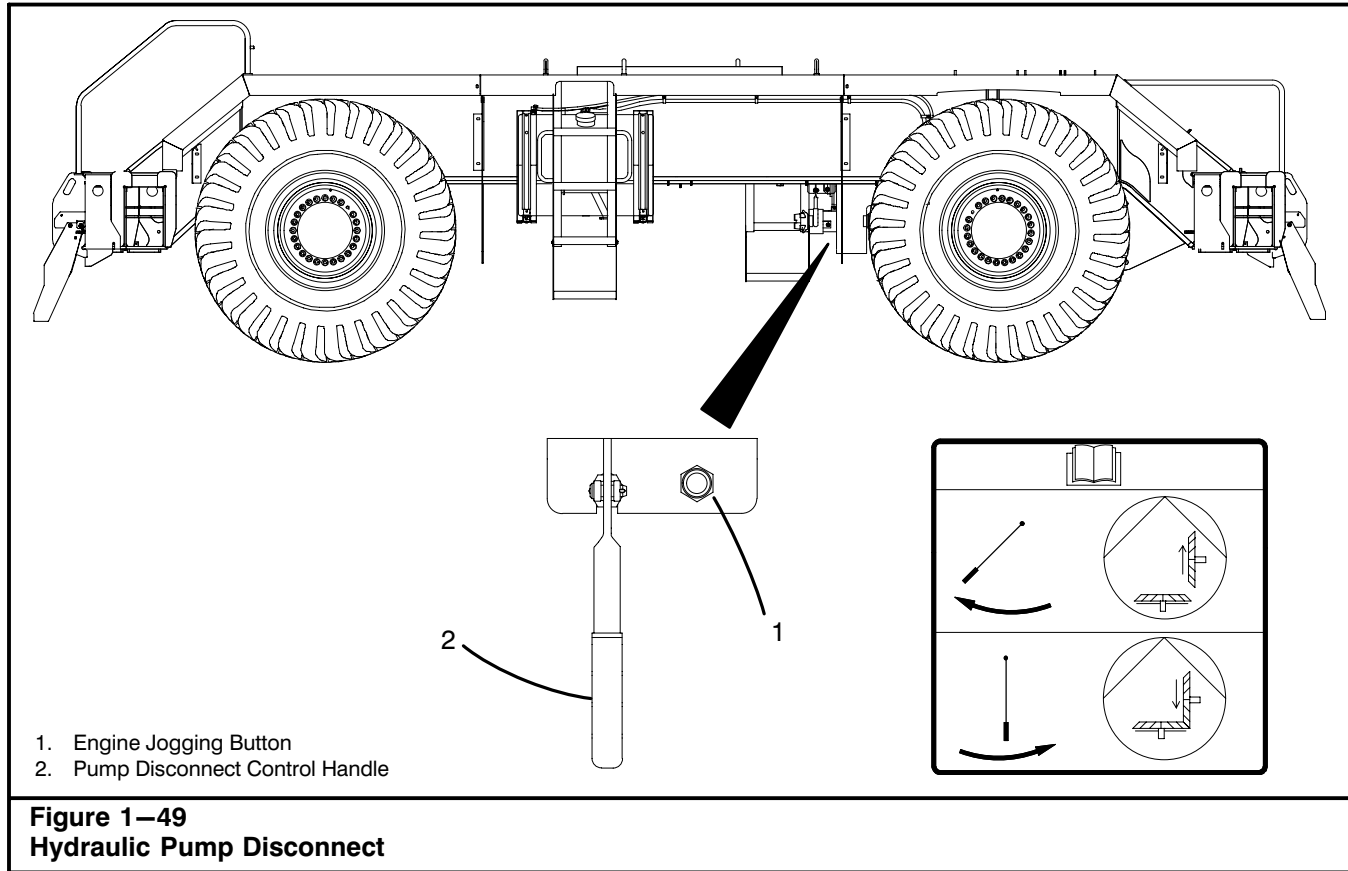
This steer mode allows steering with all four wheels. The front and rear wheels turn simultaneously in the same direction which moves the crane in the diagonal path of travel. This gives the operator another method of maneuvering the crane where job site conditions require it. Use this steer mode for job site travel only; not for extended or high speed travel.

Changing Steering Modes

The rear wheel offset light, on the steering column in the indicator light bars (Figure 1-46), is designed to assist the operator in changing steering modes by determining when the rear wheels are straight. This light will come on anytime the rear wheels are not in-line with the carrier. Use the following procedure when changing steering modes:

1. Bring the crane to a complete stop.
2. Turn the steering wheel until the rear wheel offset light goes off.
3. Move the steer switch to the Conventional steering mode.
4. Check all wheels for proper alignment by traveling the crane a short distance, straight ahead, to ensure it tracks straight.
5. Bring the crane to a complete stop and move the steer mode switch to the desired steering mode.

Operator's Manual



Hydraulic Pump Disconnect

The hydraulic pump disconnect is used to engage and disengage the main hydraulic pump. Disengaging the main pump aids in engine start-up by reducing cranking resistance. It also allows for disengaging the pump for highway travel. Refer to Figure 1–49.

The crane is equipped with an engine jogging button, near the disconnect control handle, to aid in engaging the hydraulic pump.

Note: In extremely cold weather, it is recommended that the pump be allowed to cycle without a load for 3–5 minutes at low engine speed. Throttle engine to half throttle and cycle the boom telescope for another 3–5 minutes. This will help prevent cold oil from damaging the main pump.

To Engage The Main Pump

1. Warm up the engine using the normal start-up and warm-up procedure.
2. Park the crane and engage the travel park brake.
3. Shift the transmission to neutral and shutdown the engine.

CAUTION

Do not attempt to engage or disengage the pump with the engine running. Damage could occur to the pump and/or pump drive.

4. Push the pump disconnect control handle in to the limit of its travel. If control handle cannot be pushed to the limit, push and release the engine jogging button and push the handle in to the limit again.

To Disengage The Main Pump

1. Park the crane and engage the travel park brake.
2. Shift the transmission to neutral and shutdown the engine.

CAUTION

Do not attempt to engage or disengage the pump with the engine running. Damage could occur to the pump and/or pump drive.

3. Pull the handle out, to the limit of its travel.

Operator's Seat

This operator's seat is controlled by manual controls. Refer to Figure 1–50.



WARNING

Do not make seat or console adjustments while operating the crane or while crane is in motion. Discontinue operations and properly park the crane before making adjustments.

1. Seat And Console Release Lever

Move the seat and console release lever to the left and hold. Position the seat as desired and release the lever to lock the seat in place.

2. Seat Release Lever

Move the seat release lever to the left and hold. Position the seat as desired and release the lever to lock the seat in place.

3. Seat Height Adjustment Lever

Move the height adjustment lever to the left and hold. Position the seat as desired and release the lever to lock the seat in place.

4. Arm Rest Height Adjustment Knob

Loosen the knob on the inside of the arm rest. Position the arm rest as desired and tighten knob to lock the arm rest in place.

5. Seat Back Adjustment Lever

Raise the lever and adjust the seat back to the desired position. Release the lever to lock the seat back in place.

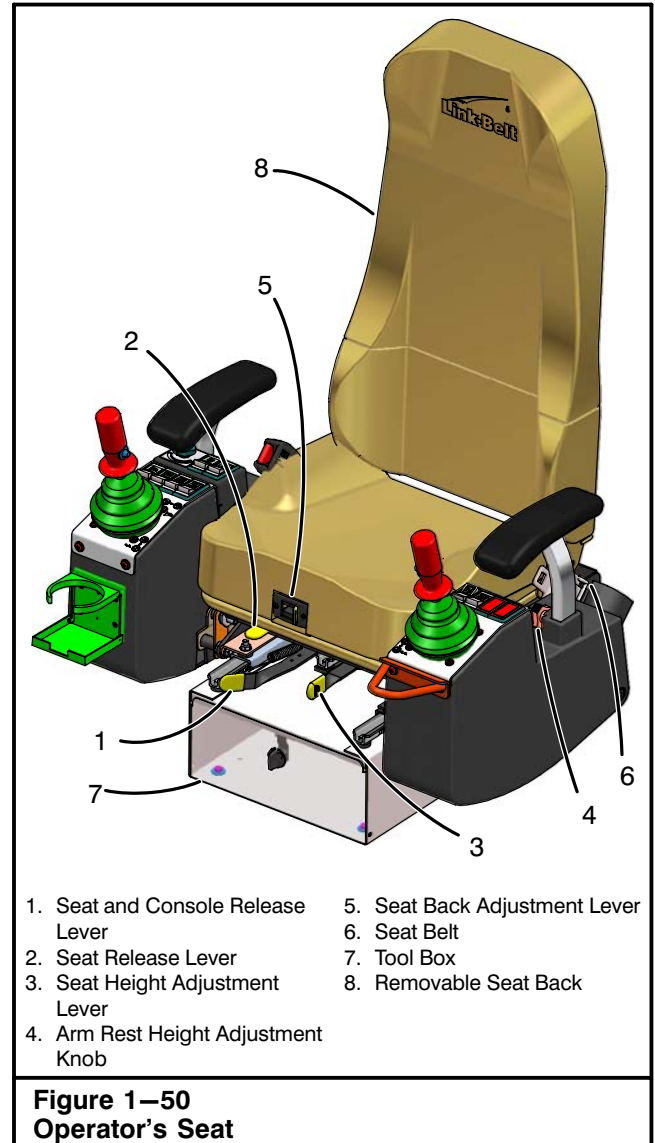
6. Seat Belt

A seat belt is provided and must be worn during all operations. To fasten the seat belt pull the belt out of the retractor and insert the tongue into the buckle until you hear a snap and feel the latch engage. Ensure the belt is not twisted and is fitting snugly around the hips, not around the waist.



WARNING

Always wear the seat belt while operating the crane. The seat belt must be snug and low across the hips.



**Figure 1–50
Operator's Seat**

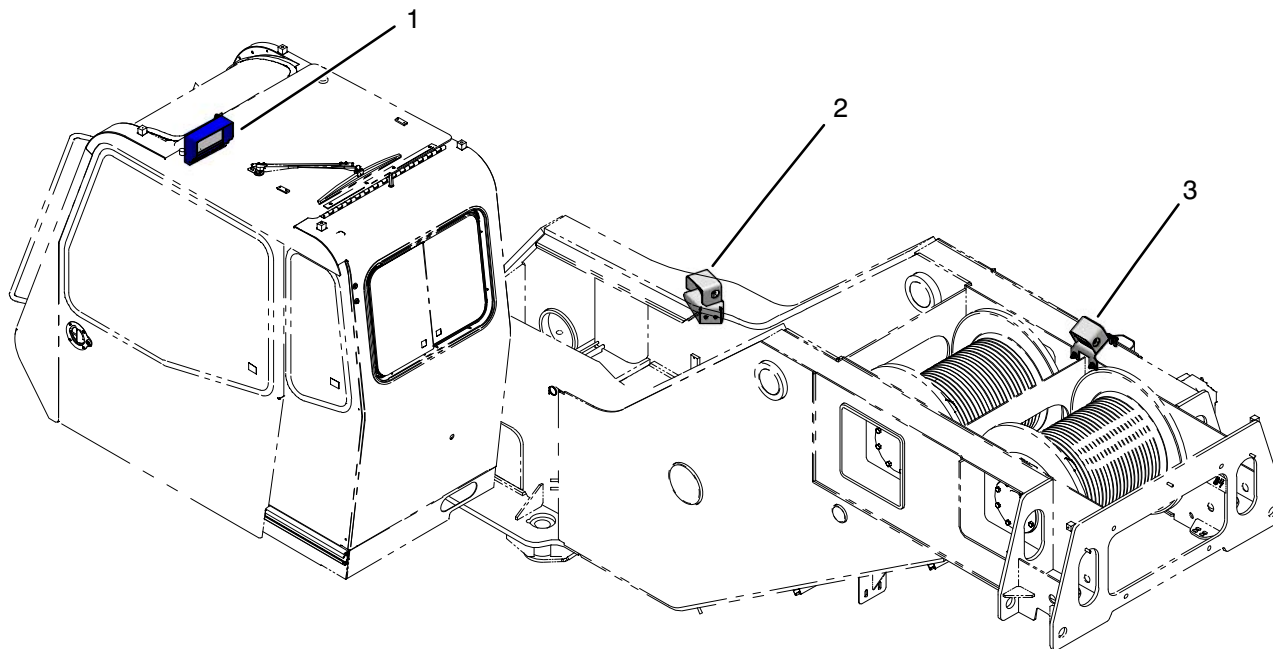
7. Tool Box

A tool box is provided under the operator's seat to store tools and other crane accessories.

8. Removable Seat Back

The seat back can be removed for access to the electrical panel. To remove, pull two pins on back of seat and lift the seat back.

Operator's Manual



- 1. Video Monitor
- 2. Right Swing Camera
- 3. Winch Camera

Figure 1–51
Upper Camera Locations

Winch And Right Swing View Cameras

The upper is equipped with two cameras. One camera gives the operator a view of the winches to monitor wire rope spooling on the winch drum(s). The other camera gives a view of the area to the right side the crane to be used before swinging the upper to the right.

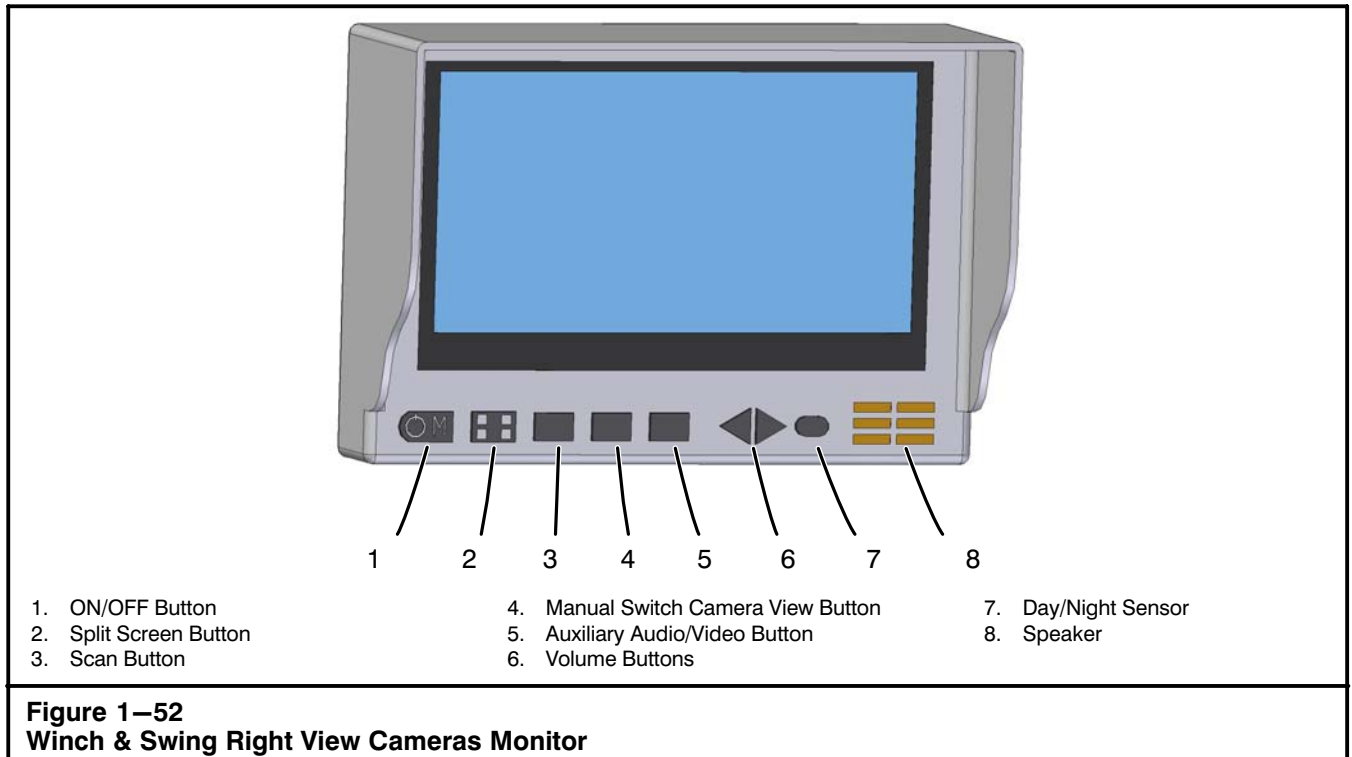
During initial crane start up and inspection each day, verify the proper operation of all cameras. If the cameras are found to be damaged or missing, order replacement parts as required to repair or replace the damaged or

missing component. Continue operation with caution as you should normally do with all crane operations.



WARNING

Cameras are being supplied as an operator's aid. They do not relieve the crane operator of any responsibilities during crane operation. Always look directly in the direction of crane travel or at the load during crane lifting operations. Do not rely solely on the camera to determine if an obstruction is present.



A video monitor in the operator's cab is supplied to help the crane operator see areas that can be obstructed from his view. This monitor can distract the crane operator from his normal duties if not used properly. Use these monitors as an operator's aid and not as the sole method of seeing where the crane is going. Primary attention is to be on where the crane is going or the lifted load, not the monitor.

Cameras do not eliminate the requirement for a signal person during crane travel. Do not attempt to move the crane without a signal person. A trained signal person working in conjunction with a trained crane operator is required to move the crane.

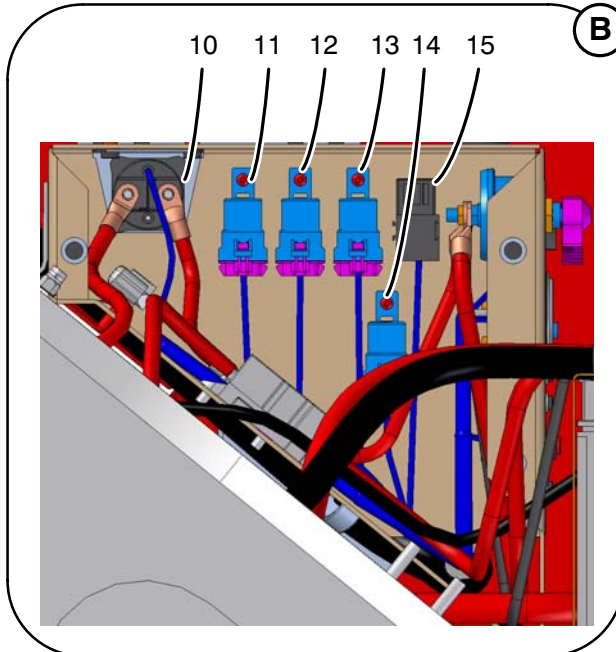
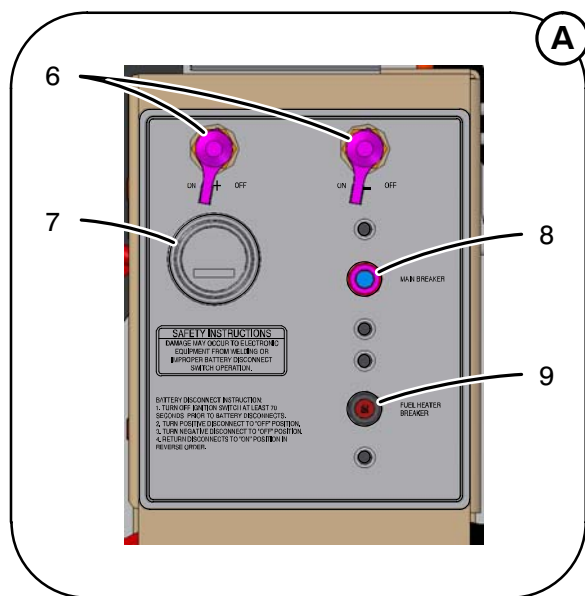
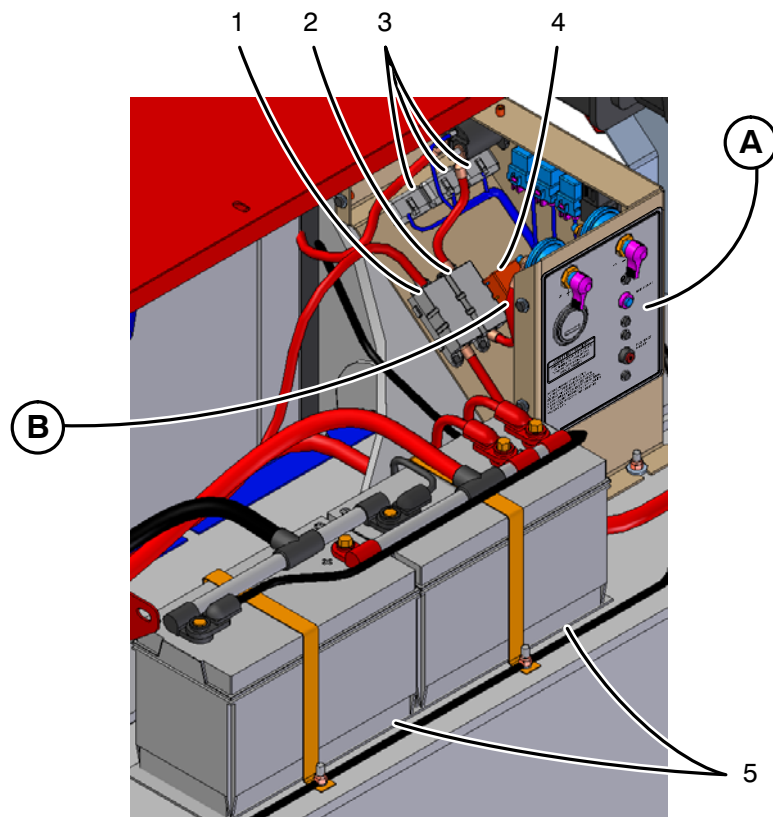


WARNING

Do not rely solely on the cameras and monitors.

- The field of vision of the camera may be limited.
- Just because the monitor looks clear does not mean that an obstruction does not exist.
- Images in the monitor may be farther than they appear.
- Images in the monitor may be distorted.
- Weather conditions (ice, snow, rain, etc) may distort or block the camera lens and inhibit visibility.
- Do not operate the crane using the camera's alone.
- Always look before moving the crane.
- Always employ a signal person to move the crane.

Operator's Manual



- | | | |
|--|---------------------------------------|--------------------------------|
| 1. 200 Amp Mega Fuse – Alternator | 6. Battery Disconnect Switches | 11. 30 Amp First Gear Relay |
| 2. 250 Amp Mega Fuse – Air Intake Heater | 7. Hour Meter | 12. 30 Amp Second Gear Relay |
| 3. Fuse Blocks | 8. 105 Amp Circuit Breaker—Main | 13. 30 Amp Start Lockout Relay |
| 4. 75 Amp Run Relay | 9. 50 Amp Circuit Breaker—Fuel Heater | 14. 30 Amp Park Brake Relay |
| 5. Batteries | 10. 200 Amp Air Intake Relay | 15. 70 Amp Start Relay |

Figure 1–53
Power Panel

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Mega Fuses

There are two mega fuses mounted in the electrical control center behind the power panel. Refer to Figure 1–53. These fuses protect the alternator and engine air intake heater electrical circuits. If these systems are not functioning, check and replace these fuses as required.

Fuse Blocks

There are three fuse blocks behind the power panel. Refer to Figure 1–53. These fuses protect the following electrical circuits.

Fuse Block	Amp	Qty	Circuit
1	5	1	Rear Oscillation Adjust Switch
	5	1	Hour Meter
	7.5	1	Brake Light Switch Engine Jog Switch
2	5	1	Hydraulic Oil Cooler Fan
	5	1	Engine Control Module (ECM)
	30	1	
3	10	1	Run Relay 1 st & 2 nd Gear Relays
	30	1	Air Conditioner

If these systems are not functioning, check and replace these fuses as required.

Power Panel

The power panel is mounted on the right rear of the crane behind the engine grille. Refer to Figure 1–53.

Circuit Breakers

The circuit breakers are mounted on the power panel. Refer to Figure 1–53. There are two manual reset type circuit breakers which service the crane's electrical system. If a breaker has been tripped, push and release the breaker to reset.

Hour Meter

The hour meter is mounted on the power panel. Refer to Figure 1–53. The hour meter registers engine operating hours. It is useful in determining lubrication and maintenance schedules.

Battery Disconnect Switches

The battery disconnect switches are on the power panel. Refer to Figure 1–53.

CAUTION

Ignition switch should be shut off at least 70 seconds prior to turning battery disconnect switches to the "OFF" position.

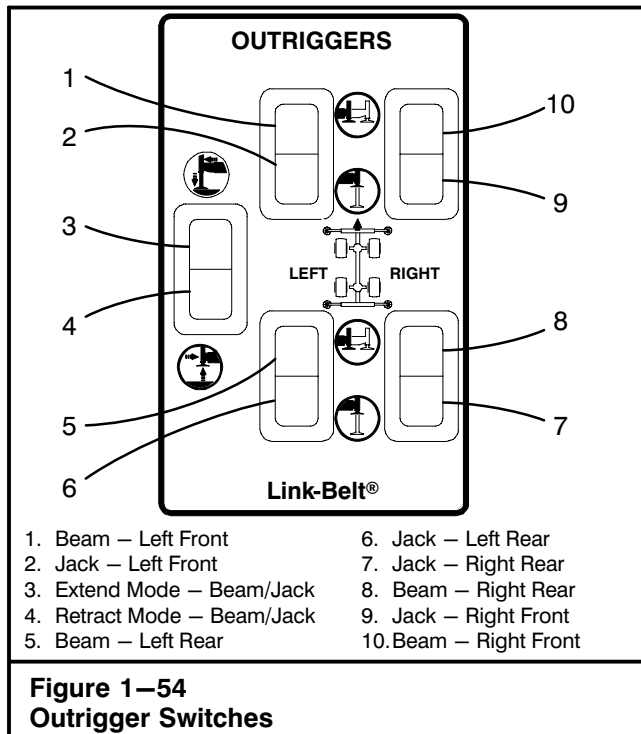
Turn the battery disconnect switches to the "OFF" position before welding on the crane. Major damage may occur to the electronic equipment from welding on the crane prior to turning battery disconnect switches to the "OFF" position.

Ignition switch should be shut off at least 70 seconds prior to turning battery disconnect switches to the "OFF" position. If disconnect switches are turned off in less than 70 seconds after ignition switch is shut off, active fault codes and incorrect ECM information can occur. Move the battery disconnect switches to the "Off" position before welding on the crane to protect the crane's electronic components from damage due to an electric arc type welder.

1. Shutdown the engine and wait at least 70 seconds.
2. Turn positive battery disconnect switch to the OFF position.
3. Turn negative battery disconnect switch to the OFF position.
4. Return battery disconnect switches to the ON position in reverse order.

Note: If the batteries are disconnected, the start-up time for on-board computer systems will be longer than normal.

Operator's Manual



Outrigger Operation

The outriggers can be used in any one of three positions; fully retracted, intermediate extended, or fully extended. The outriggers are controlled by switches on a hand held control box connected by a cable (Refer to Figure 1-54) and the extend position levers on the outrigger boxes (Refer to Figure 1-55). Each outrigger switch (Left Front, Left Rear, Right Front, Right Rear) controls all functions of that outrigger beam and jack cylinder. The mode switch controls outrigger cylinder direction, extend/retract. The extend position levers control the extend length of the beams. They allow for beams to be fully extended, or limits them to intermediate extended lengths based on the selected position of the extend position levers.

The outrigger pontoons must set on a smooth, solid surface flush with ground with no hills or valleys under them or they may be damaged or destroyed. If there is any doubt as to the ground conditions, use mats under the pontoons. Check pontoons before and during operations. If they are allowed to settle, they may lose their effectiveness, and make continued operations unsafe.

A bubble level is mounted in operator's cab, to assist in determining when crane is level. Refer to Figure 1-58. A hand held, tethered outrigger remote control box stores on the right side wall of the operator's cab near the operator's seat. The outrigger remote control box allows the operator to remotely control all outrigger functions.



WARNING

Do not extend or retract an outrigger beam or jack unless it is in full view of the operator or a signal person. Ensure all personnel and obstructions are clear from the path of the machinery.

To Extend Outrigger Beams

1. Park crane in the desired location. Engage the travel park brake, shift the transmission to neutral, and shutdown engine. Engage main hydraulic pump.
2. Remove the pontoons from storage and attach one to each outrigger jack.



WARNING



Pontoons must be attached to outrigger jacks before crane is set on outriggers. If pontoons should settle, the jacks could disengage from the pontoons, causing a loss of stability.

3. Determine the outrigger position desired. Set the extend position levers as required. (Refer to Figure 1-55.)



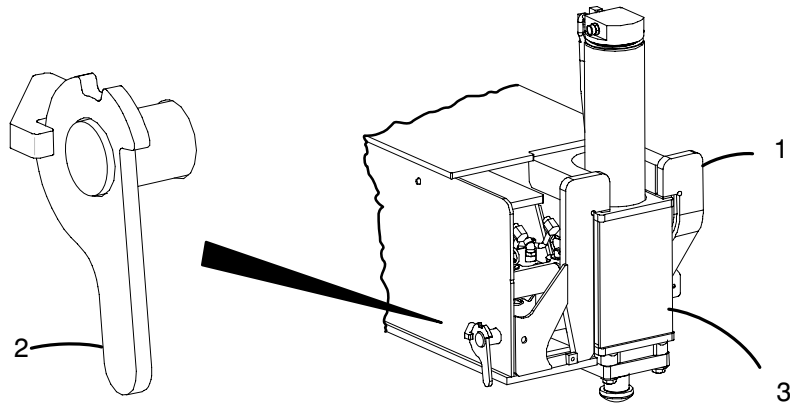
WARNING

When making lifts on outriggers, all outrigger beams must be equally extended; all fully retracted, all intermediate extended, or all fully extended. Failure to do so may cause a loss of stability, serious personal injury, and/or major crane damage.

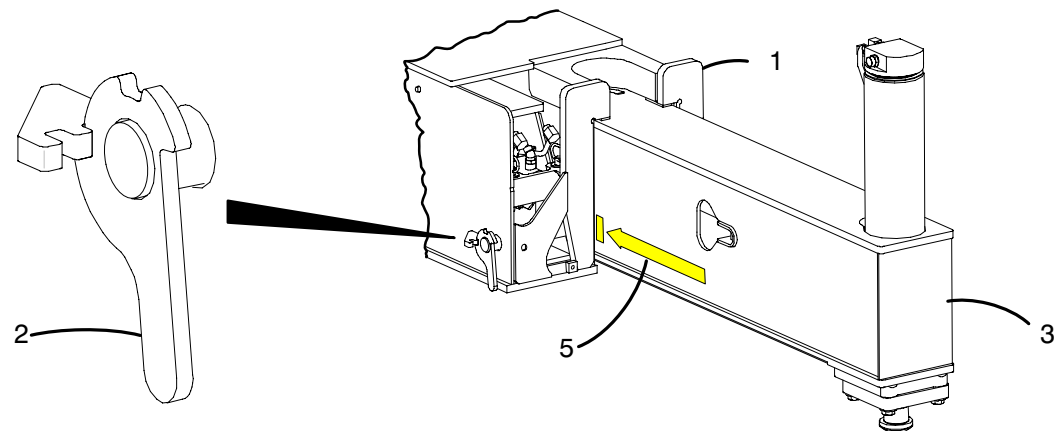
4. Start the engine.
5. Push an outrigger switch to the beam position  and hold.
6. Push the mode switch to extend mode on position  and hold until the beam reaches the selected position; intermediate extended or fully extended.
7. When beam reaches selected position, release both switches.
8. Repeat Steps 5-7 for each outrigger beam until all the beams are set to the selected position.

Note: As conditions warrant, a proficient crane operator may operate multiple beams such as one end or one side at the same time.

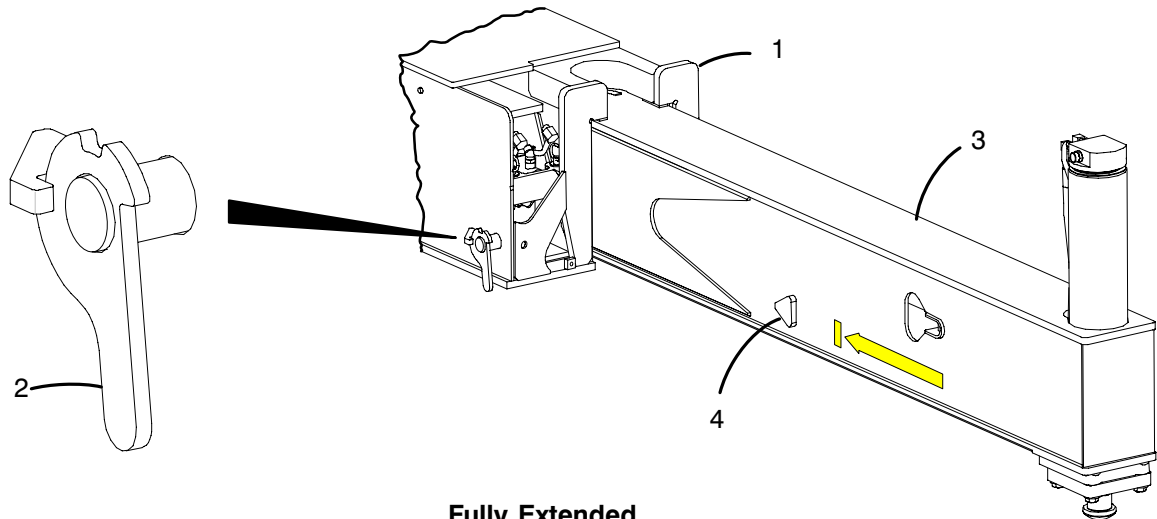
9. If the intermediate extended beam position is to be used, visually check that all beams are properly positioned in the intermediate extended position. All beams must be extended until the stop plate contacts the extend position lever and the arrow is aligned with the outrigger box collar. Refer to Figure 1-55.



Fully Retracted



Intermediate Extended



Fully Extended

- 1. Outrigger Box Collar
- 2. Extend Position Lever
- 3. Outrigger Beam

- 4. Stop Plate (For Intermediate Position)
- 5. Alignment Arrow (For Intermediate Position)

Figure 1–55
Outrigger Extend Position Lever

Operator's Manual

10. Set the Rated Capacity Limiter to the proper setting to match the position of the outrigger beams.

Note: If an “Outrigger Position Mismatch” warning appears on the RCL Display, ensure the outriggers are in the correct position and select the configuration on the RCL Display to match the current outrigger position.



WARNING


When making lifts with the crane on outriggers, all outrigger beams must be equally extended; fully retracted, intermediate extended, or fully extended.

When making lifts with the outrigger beams in the intermediate extended position, the extend position lever must be in the intermediate extended position. Visually check that all outrigger beams are extended until the stop plate contacts the extend position lever and the arrow is aligned with the outrigger box collar before beginning operations.

Check that the Rated Capacity Limiter is set to the correct outrigger position before beginning operation.


Failure to perform any of the above may cause serious personal injury and/or major crane damage.

To Extend Outrigger Jacks – Raise The Crane

1. With the beams extended to the selected position (fully retracted, intermediate extended, or fully extended), push an outrigger switch to the jack position  and hold.

CAUTION

When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum(s) to prevent tension on the wire rope(s).

2. Push the mode switch to extend mode on  and hold until the jack cylinder is fully extended.
3. Release both switches.
4. Repeat Steps 1–3 for each outrigger jack.
5. Raise or lower jacks as required to level the crane.

Note: As conditions warrant, a proficient crane operator may operate multiple jack cylinders such as one end or side at the same time.

Note: A bubble level is provided on the right side operator's cab wall to assist in determining when the crane is level.

6. Check that all tires are clear of the ground and pontoons are not settling.



WARNING

All capacities listed in the Crane Rating Manual, when on outriggers, are based on all tires clear of the ground, all outrigger beams equally extended (fully retracted, intermediate extended, or fully extended), using the proper capacity chart for the outrigger position and the crane setting level on a firm, solid surface. Major reductions in the crane lifting capacity and unsafe operating conditions can result if these conditions are not met.



To Retract Outrigger Jacks – Lower The Crane

1. Fully retract the boom. Swing the upper over the front of the carrier and engage the travel swing lock.
2. Fully boom down.




WARNING

Do not extend or retract an outrigger beam or jack unless it is in full view of the operator or a signal person. Ensure all personnel and obstructions are clear from the path of the machinery.

3. Push an individual outrigger switch to the jack position  and hold.
4. Push the mode switch to retract mode on position  and hold until the jack cylinder is fully retracted.
5. Release both switches.
6. Repeat Steps 3–5 for each outrigger jack.

Note: As conditions warrant, a proficient crane operator may operate multiple jack cylinders such as one end or one side at the same time.

To Retract Outrigger Beams

1. Set the extend position levers in the fully retracted position. (Refer to Figure 1–55.)
2. Push an individual outrigger switch to the beam position  and hold.

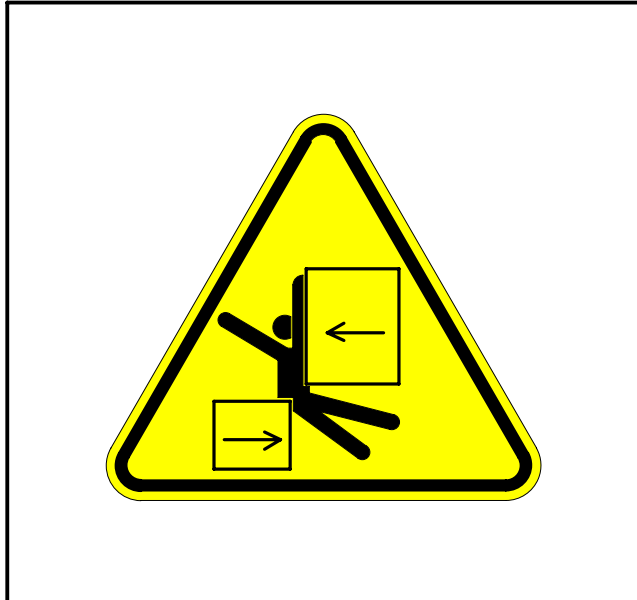



Figure 1-56
Keep Clear of Pinch Points

3. Push the mode switch to the retract mode on position  and hold until the beam is fully retracted.
4. Release both switches.
5. Repeat Steps 1-4 for each beam.

Note: As conditions warrant, a proficient crane operator may operate multiple beams such as one end or one side at the same time.

6. Store all pontoons in the brackets provided.

Crane System Controls

The following, along with Figure 1-58, gives detailed instructions of individual controls related to crane operation. It is essential that the operator knows the function of each control and its duty in the overall operation of the crane.



WARNING

Read and understand all "Operating Safety" procedures as well as all other operating instructions in this Operator's Manual and the engine manufacturer's manual before attempting to operate the crane. Operation of the crane by unqualified personnel may result in an accident.

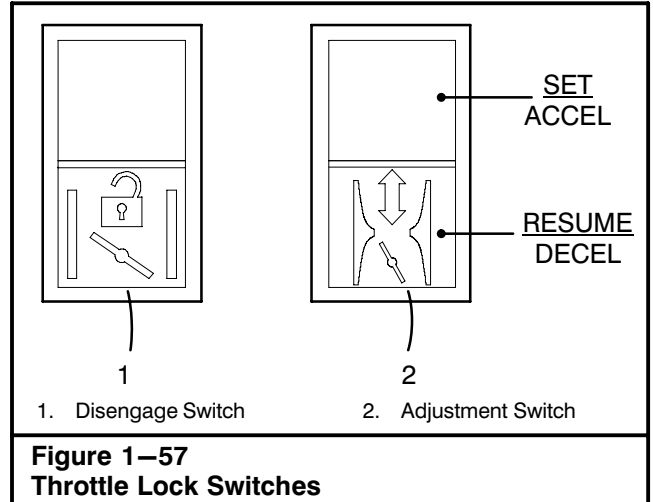


Figure 1-57
Throttle Lock Switches

Engine Throttle

The crane is equipped with a throttle pedal to control the engine speed. Press pedal down to increase engine speed; release to decrease engine speed.

Throttle Lock System

To lock the throttle, press and hold the adjustment switch to the "SET/ACCEL" side until desired engine speed is reached and release switch. Refer to Figure 1-57. The engine should continue to run at a constant speed when the throttle pedal is released.

To increase throttle lock setting, press and hold the adjustment switch to the "SET/ACCEL" side until desired engine speed is reached and release switch. The throttle lock setting can also be increased incrementally by pressing and releasing (tap up) the "SET/ACCEL" side.

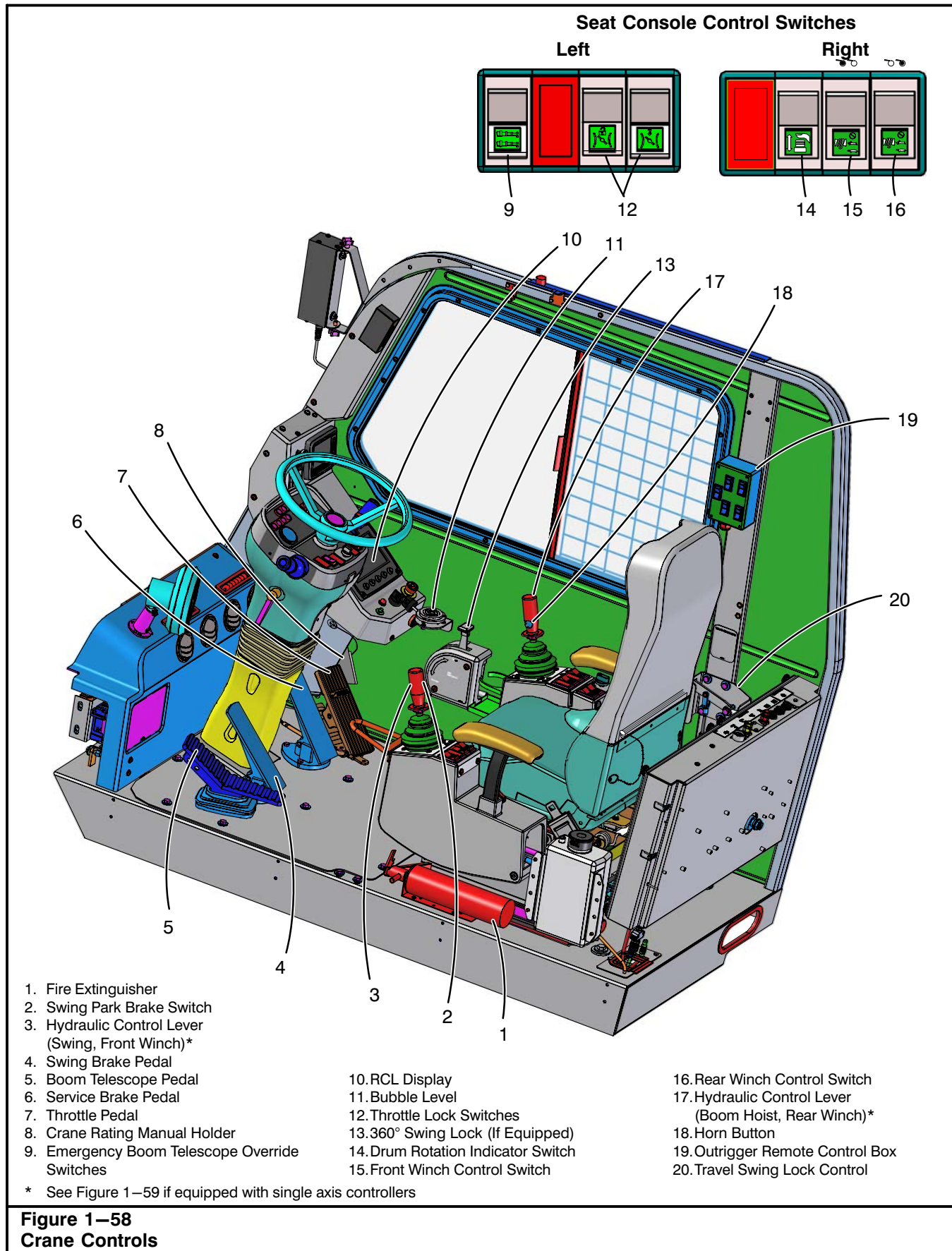
To decrease throttle lock setting, press and hold the adjustment switch to the "RESUME/DECEL" side until desired engine speed is reached and release switch. The throttle lock setting can also be decreased incrementally by pressing and releasing (tap down) the "RESUME/DECEL" side.

To return to idle, press and release the bottom part of the disengage switch.

To resume a previous throttle lock setting, press and release the adjustment switch to the "RESUME/DECEL" side.

Note: The throttle lock system is deactivated anytime the ignition switch is turned off.

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Swing System

Rotation of the upper over the carrier is controlled by the swing system. Use the following controls to operate the swing function of the crane:

Swing Brake Pedal

The swing brake pedal is used to stop rotation of the upper over the carrier. To apply the swing brake, push down on the swing brake foot pedal. To release the swing brake, release the swing brake foot pedal.

Swing Control Lever

The control lever, on the left side of the operator's seat, is used to operate the swing function of the upper. Move the control lever to the  position to swing left; move it to the  position to swing right.



WARNING

Do not exceed maximum boom angles listed on the "Backward Stability – Maximum Boom Angle" chart in the Crane Rating Manual or the Backward Stability label in the operator's cab. Crane may tip over backwards causing personal injury and/or crane damage.

To Swing The Upper

1. Compare the boom configuration and length to the capacity chart in the Crane Rating Manual. Position the boom safely within the limits specified on the capacity chart.
2. Ensure that all personnel are out of the swing path. Dangerous pinch points are created during swinging.



DANGER

Swing slowly and cautiously. Watch for centrifugal force. Out swing of a load increases the load radius and thus decreases capacity. Load out swing may result in tipping or damaging the crane.

All personnel and equipment must be out of the path of the rotating upper. Failure to do so could result in serious personal injury and/or major crane damage.

3. Fully apply the swing brake pedal and release the swing park brake and/or swing lock(s).
4. Release the swing brake pedal and begin to engage the swing control lever.

To Stop Upper Swing

1. Ease swing control lever into the neutral position.
2. Apply the swing brake to bring the upper to a complete stop.
3. Engage the swing park brake as required.
4. Check engagement of the swing park brake by trying to swing right, then left. The upper should not swing.


Travel Swing Lock

Use the travel swing lock to lock the upper directly over either the front or rear of the carrier. The travel swing lock will engage in these two positions only. Use of the travel swing lock is mandatory when traveling or transporting the crane and during pick and carry operations.


To Release The Travel Swing Lock

1. Fully apply the swing brake pedal.
2. Pull the travel swing lock lever up.

Note: In order to disengage the travel swing lock, it may be necessary to swing the upper slightly to relieve the pressure on the swing lock pin.

3. Move the lever to the right and release. The lever should remain in the released  position.

To Engage The Travel Swing Lock

1. Position the upper directly over either the front or rear of the carrier. Fully apply swing brake pedal.
2. Pull the travel swing lock lever up and to the left. Then push the lever down to the locked  position.

Note: In order to engage the travel swing lock, it may be necessary to swing the upper slightly to align the swing lock pin and retaining ring on the carrier deck.

3. Check the engagement of the travel swing lock by trying to swing the upper right, then left. The upper should not swing.

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Swing Park Brake

The swing park brake is a multiple disc type brake and is used for holding the upper, in any position, over the carrier during normal, stationary crane operations. Engage the travel swing lock and release the swing park brake for pick and carry operations and anytime the crane is traveled, lifted, or transported. An indicator light on the Crane Control Display (Figure 1—42) will illuminate when the swing park brake is applied.

CAUTION

Do not leave the swing park brake applied during pick and carry operations or when traveling, lifting, or transporting the crane. Use the travel swing lock. Failure to release the swing park brake during these operations may result in damage to the swing mechanism.

To Release The Swing Park Brake:

1. Fully apply the swing brake pedal.
2. Push the top part of the swing park brake switch on the left seat console to release the park brake. The indicator light will go out. Refer to Figure 1—58 for switch (or Figure 1—59 if equipped with single axis controls) and Figure 1—42 for indicator light location.

To Apply The Swing Park Brake:

1. Rotate the upper to the desired position over the carrier. Apply the swing brake pedal to bring the upper to a complete stop.

CAUTION

Do not attempt to apply swing park brake with the upper in motion. This practice will result in damage to the swing mechanism. Use the swing brake pedal to stop rotation of the upper.

2. Push the bottom part of the swing park brake switch on the left seat console to apply the park brake. The indicator light will illuminate. Refer to Figure 1—58 for switch (or Figure 1—59 if equipped with single axis controls) and Figure 1—42 for indicator light location.
3. Check engagement of swing park brake by trying to swing upper right, then left. Upper should not swing.

360° Swing Lock (If Equipped)

The 360° swing lock is a positive lock against rotation of the upper over the carrier. The upper is mechanically locked by a manually operated pawl that engages the gear teeth in the turntable bearing. Use the 360° swing lock during normal, stationary crane operations. Engage the travel swing lock and release the 360° swing lock anytime the crane is used for pick and carry operations or is traveled, lifted, or transported.

CAUTION

Do not leave the 360° swing lock engaged during pick and carry operations or when traveling, lifting, or transporting the crane. Use the travel swing lock. Failure to release the 360° swing lock during these operations may result in damage to the swing mechanism.

To Disengage The 360° Swing Lock:

1. Fully apply the swing brake pedal.
2. Move the 360° swing lock lever to the “Disengage” position.

To Engage The 360° Swing Lock:

1. Rotate the upper to the desired position over the carrier. Apply the swing brake pedal to bring the upper to a complete stop.

CAUTION

Do not attempt to engage 360° swing lock with the upper in motion. This practice will result in damage to the swing mechanism. Use the swing brake pedal to stop rotation of the upper.

2. Move the 360° swing lock lever to the “Engage” position.

Note: In order to engage the 360° swing lock, it may be necessary to swing the upper slightly to allow the swing lock pawl to engage in the turntable bearing gear teeth.

3. Check engagement of the 360° swing lock by trying to swing upper right, then left. The upper should not swing.

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Wire Rope Winch System

This system controls raising and lowering the winch wire ropes. The system is equipped with a two speed motor that, when activated, will approximately double winch line speed. The controls for the system are shown in Figure 1–58 (or Figure 1–59 if equipped with single axis controls). Review the following for control descriptions and brief summary of operation.

CAUTION

When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum(s) to prevent tension on the wire rope(s).



WARNING

Cold weather operation of the winch requires a warm-up procedure. Failure to properly warm-up the winch may result in winch brake slippage. Warm-up the winch before beginning crane operations.

Warm-Up Procedure

A warm-up procedure is recommended at each start-up and is essential at ambient temperatures below 40°F (4°C). Allow the engine to run at idle speed, with the main hydraulic pump engaged and the winch control lever(s) in neutral, for several minutes. Once the hydraulic oil begins to warm, operate the winch at low speed, with no load, lifting and lowering only the hook block or hook ball until warm oil circulates throughout the winch.

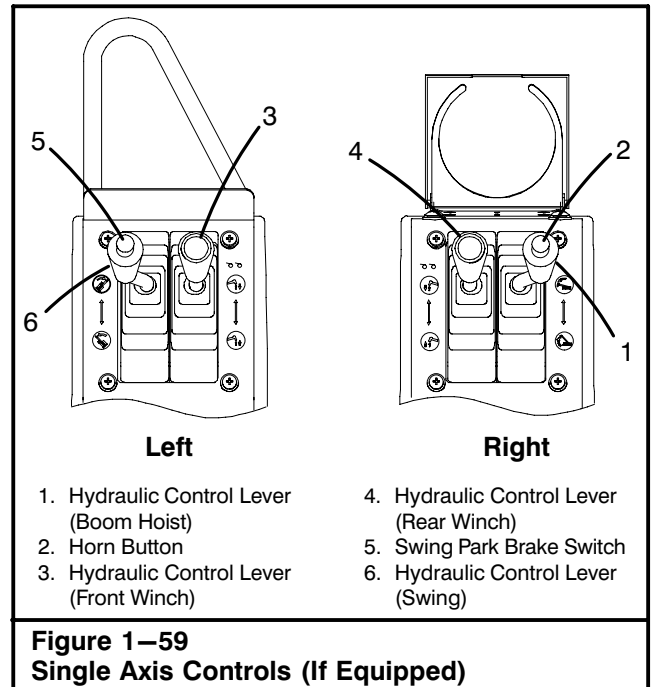


Figure 1–59
Single Axis Controls (If Equipped)





WARNING

The weight of the load must be known before making a lift. Compare the load weight to the appropriate capacity chart in the Crane Rating Manual to ensure compliance with capacity ratings. Compare the load weight to the Wire Rope Capacity chart in the Crane Rating Manual to determine the number of parts of line required to lift the load. Rig and set up the crane to ensure compliance with both the appropriate crane capacity chart and Wire Rope Capacity chart in the Crane Rating Manual. Properly set the Rated Capacity Limiter to the correct crane configuration.



Do not lift a load to the point where the hook block, hook ball, and/or the load contacts the head machinery. “Two blocking” could damage the hook block, hook ball, wire rope, and/or the head machinery. Always keep the hook block, hook ball, and/or the load a safe distance from the boom.

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Front Winch Control Lever (If Equipped)

This lever controls the front winch drum. Pull this control lever back to the  position to lift the load. Push this control lever forward to the  position to lower the load. Refer to "Winch Operation" for more specific instructions.

Rear Winch Control Lever

This lever controls the rear winch drum. Pull this control lever back to the  position to lift the load. Push this control lever forward to the  position to lower the load. Refer to "Winch Operation" for more specific instructions.

Winch Operation

The following is a brief description of the basic procedure for operating the wire rope winch. Crane operations are to be performed only by a qualified operator who has read and fully understands the entire content of this Operator's Manual.

To Lift A Load: Attach the hook block or hook ball to the load. Position head machinery directly above the load and pull the control lever back toward the operator. Return the control lever to neutral to stop the load.

Note: When both winch levers are activated simultaneously, the winch line requiring the most line pull may not function.




To Hold A Load: Return the control lever to the neutral position. The automatic brake in the winch system will hold the load in position.

To Lower A Load: Push the control lever forward. Return the control lever to neutral to stop the load.


Winch Control Switch(es)

This switch is used to control engaging/disengaging the high/low speed hoist and disabling the front or rear winch. Refer to Figure 1–58.


High Speed Hoist Or Lower

Press the winch control switch to the high speed () position. Move the control lever to the  or  position. The high speed hoist will activate after engaging the control lever.


Note: Using the high speed hoist reduces the maximum line pull by approximately one half. The high speed hoist button can be activated at anytime during either winch mode. Switching the high speed hoist button before engaging the winch control lever will make the system work smoother.

To Return To Standard Winch Mode: Press winch control switch to the low speed () position. Winch will return to standard speed.

Winch Disable

Press the winch control switch(es) to the disable () position to disable the winch(es) to prevent inadvertent operation of the winch(es) while using the control levers to perform other operations.

Drum Rotation Indicators

This system is used to monitor winch drum speeds through the use of a mechanical signaling device mounted inside each of the winch control levers. To activate the system, push the bottom part of the drum rotation indicator switch  on the right seat console (Figure 1–58) to the "ON" position (indicator within switch will illuminate). Place your thumb over the end of the control lever being used. As the winch drum rotates, a mechanical signal will be felt with your thumb. The frequency of the mechanical signal is a direct indication of the winch drum speed. Push the top part of the drum rotation switch to deactivate system.

First Layer/Third Wrap Indicator (If Equipped)

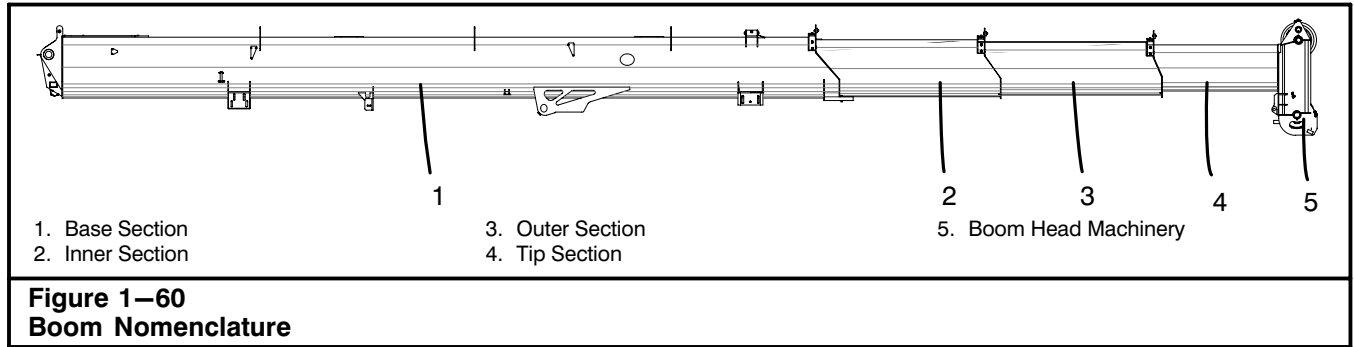
The crane may be equipped with a first layer/third wrap warning system. This system allows the operator to monitor the wire rope windings on the drum(s). An audible alarm will sound intermittently and "First Layer" will appear in the warning message area of the RCL Display to alert the operator that the wire rope is down to the first layer on the winch drum(s). When the wire rope is down to the third wrap on the winch drum(s), an audible alarm will sound continuously, and "Third Wrap" will appear in warning message area on the RCL Display. If enabled and activated, the winch function will also cutout with the third wrap alarm. Refer to First Layer/Third Wrap Calibration in Section 3 of this Operator's Manual for calibration procedures.



WARNING

Three (3) full wraps of wire rope must be maintained on the winch drum(s) at all times during operation. Wire rope failure may occur.

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Boom Hoist System

Raising and lowering the boom is controlled by the boom hoist control lever on the right arm rest. Refer to Figure 1-58 (or Figure 1-59 if equipped with single axis controls).




WARNING

Do not exceed maximum boom angles listed on the “Backward Stability – Maximum Boom Angle” chart in the Crane Rating Manual or the Backward Stability label in the operator’s cab. Crane may tip over backwards causing serious personal injury and/or major crane damage.

To Raise The Boom (Boom Up): Move the right control lever to the  position.

CAUTION

When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum(s) to prevent tension on the wire rope(s).

To Lower The Boom (Boom Down): Move the right control lever to the  position.

CAUTION

Wire rope must be spooled off the winch drum as the boom is lowered. Failure to do so may cause two blocking.

To Stop The Boom: Ease the right control lever into the neutral position.

Boom Telescope System

The crane is equipped with a four section full power boom. The four section boom consists of a base section, inner section, outer section, and a tip section. Refer to Figure 1-60.

The telescoping feature, of the boom sections, is operated through the use of two hydraulic cylinders and a cable/sheave mechanism which are an integral part of the boom assembly. The boom can be extended or retracted to any desired length using the control pedal in the operator’s cab. The telescope feature has two modes of operation:

Refer to Figure 1-61 for boom extend lengths for each mode.

Note: Boom must be fully retracted before changing boom modes.

Boom Mode “A-Max”: When using boom mode “A-Max” only the inner boom section extends/retracts. This mode offers increased strength capacities. Select this mode through the Rated Capacity Limiter System.


Boom Mode Standard “STD”: When using boom mode “STD” all boom sections extend/retract simultaneously. This mode offers increased stability capacities. Select this mode through the Rated Capacity Limiter System.



Boom Telescope Control Pedal

Figure 1-58 shows the location of the telescope control pedal in the operator’s cab. Depress the toe of the telescope control pedal to extend the boom. Depress the heel of the telescope control pedal to retract the boom. Use the telescope mode in conjunction with the telescope control pedal to extend the boom sections to the desired length.

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Boom Telescope Override Switch

The boom telescope override switch is provided to manually override the telescope system if the boom is not extending/retracting proportionally. This switch is to be used for that purpose only. While in boom mode “STD”, press the  switch to one of the two positions to override its corresponding boom section(s) so the boom can be extended/retracted proportionally. Refer to Figure 1–58 for switch location in the operator's cab. Position of the switch are defined as follows:

- 
- Top position of the switch will override the tip and outer sections allowing only the inner section to extend and retract.
- 
- The bottom position of the switch will override the inner section allowing only the tip and outer sections to extend and retract.

To Extend The Boom Sections

1. Park the crane on a firm level surface, engage the travel park brake, and shift the transmission to neutral.
2. Review the appropriate capacity chart in the Crane Rating Manual to establish boom length, angle, and load limitations.
3. Set the Rated Capacity Limiter to the desired telescope mode.

CAUTION

When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum(s) to prevent tension on the wire rope(s).

4. Depress the toe of the telescope control pedal.

CAUTION

Wire rope must be spooled off the winch drum(s) as the boom is extended. Failure to do so may cause two blocking.

5. Stop the boom sections by releasing the telescope control pedal.

Note: The telescope control pedal is spring loaded and will return to the neutral position when released.

To Retract The Boom Sections

1. Depress the heel of the telescope control pedal.

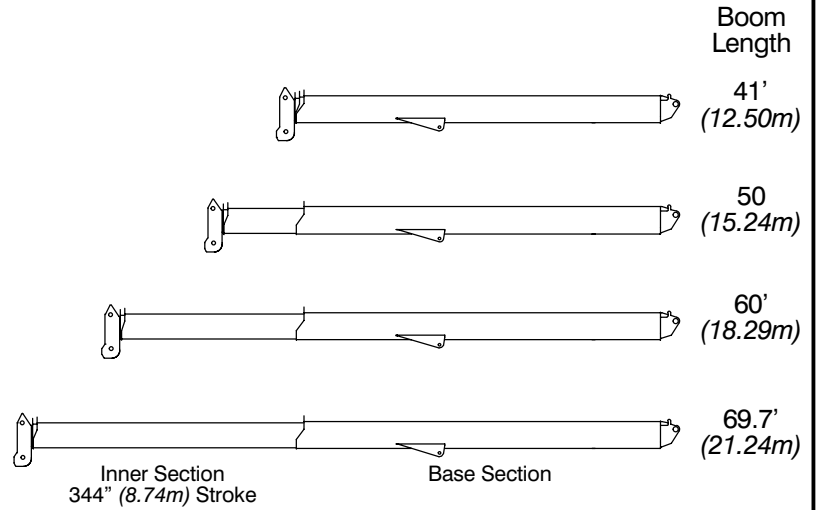
Note: Hook block or hook ball will lower when the boom is retracted. Spool rope onto the winch drum to prevent hook block or hook ball from lowering.

2. Stop the boom sections by releasing the telescope control pedal.

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Boom Mode “A-Max”

Only inner section telescopes.



Boom Mode Standard “STD”

Inner, outer, and tip sections telescope simultaneously.

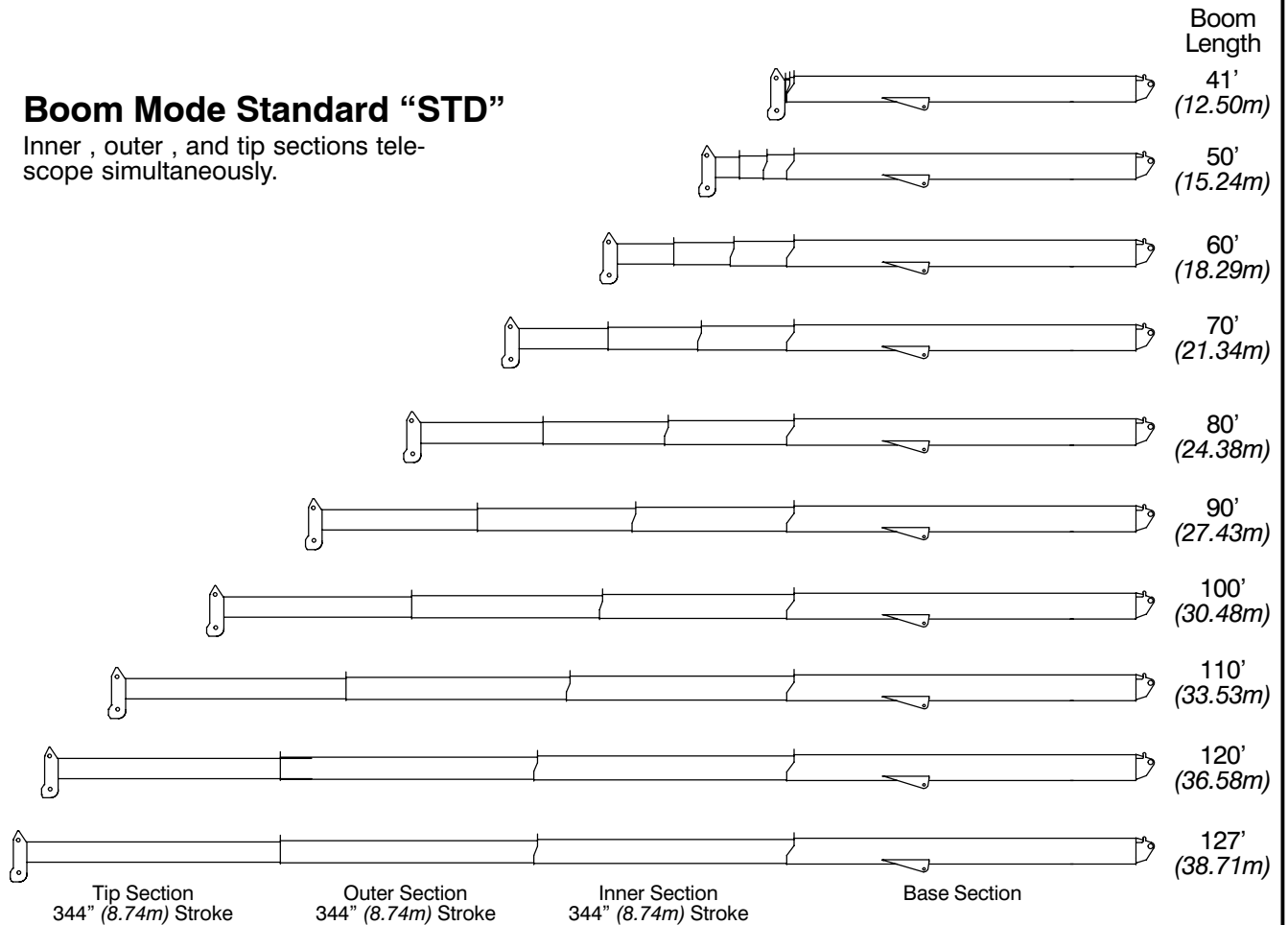
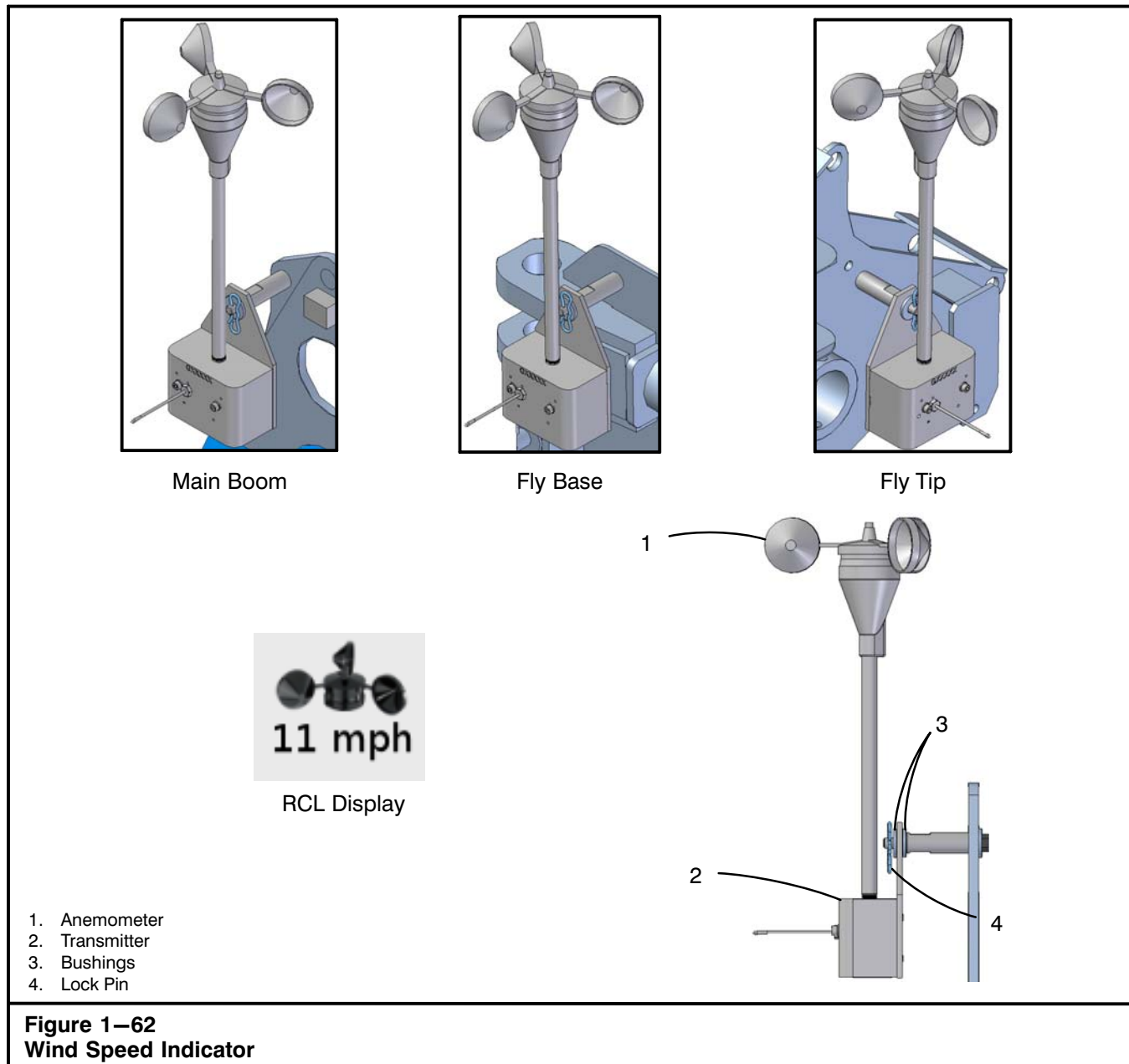


Figure 1–61
Boom Telescope Modes

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Crane Monitoring System

A Crane monitoring system is included to assist the operator in safe operation of the crane. The following systems outline some of the aids used for monitoring crane conditions during operation.

Wind Speed Indicator

The crane may be equipped with a wireless wind speed indicator. The indicator is used to monitor wind speeds at the main boom head or the fly head when

erected. Refer to Figure 1-62. An anemometer mounted on the boom head or fly transmits wind speed data to the RCL Display in the operator's cab. Refer to "Wind Speed Restrictions" in the Crane Rating Manual for more information on wind speed restrictions.

CAUTION

Remove the anemometer assembly from the boom head or fly during transport or before storing the fly to prevent damage to the unit.

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Operating In Wind And Lightning

Avoid working a crane in high winds and when there is a likelihood of lightning. Rated lifting capacities do not account for the effects of wind on a suspended load or boom. Lifting capacities should be considered acceptable for wind speeds up to 20 mph (32km/h) and appropriately reduced for wind speeds greater than 20 mph (32km/h). If work must be preformed in a wind, reduce capacities to those listed in "Wind Speed Restrictions" chart in the Crane Rating Manual. Wind blowing against the load and the boom produces a side load on the boom and reduces its capacity. When lifting loads which have large surface areas in a wind, such as building panels, the movement of the load may pose a danger to other workers or building structures.

Out swing of a load will increase the load radius, and may overload the crane. This could lead to boom and/or fly failure or the crane tipping. Monitor the wind speed using the wind speed indicator. Stop lifting operations, ground the load, and fully retract and lower the boom to horizontal if wind speed exceeds the maximum allowed listed in "Wind Speed Restrictions" chart in the Crane Rating Manual. Use the following table as a general guide.



DANGER

If there is a likelihood of lightning, immediately stop lifting operations, ground the load, and fully retract and lower the boom.

Wind Scale				
Wind Speed		Wind Strength		Inland Wind Effect
mph	km/h	Beaufort Scale	WMO* Description	
<0.6	<1	0	Calm	Calm, smoke rises vertically.
0.6 to 3.1	1 to 5	1	Light Air	Smoke drift indicates wind direction, wind vanes remain still.
3.7 to 6.8	6 to 11	2	Light Breeze	Wind felt on face, leaves rustle, wind vanes begin to move.
7.4 to 11.8	12 to 19	3	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended.
12.4 to 17.4	20 to 28	4	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move.
18.0 to 23.6	29 to 38	5	Fresh Breeze	Small trees in leaf begin to sway. Crested waves form on inland waters.
24.2 to 30.4	39 to 49	6	Strong Breeze	Larger tree branches moving. Telegraph wires whistle. Umbrellas used with difficulty.
31.1 to 37.9	50 to 61	7	Near Gale	Whole trees moving. Resistance felt walking against wind.
38.5 to 46.0	62 to 74	8	Gale	Breaks twigs off trees. Resistance felt walking against wind.
46.6 to 54.1	75 to 87	9	Strong Gale	Slight structural damage. Slate blows off roofs.
54.7 to 62.8	88 to 101	10	Storm	Trees broken or uprooted. Considerable structural damage.
* World Meteorological Organization				

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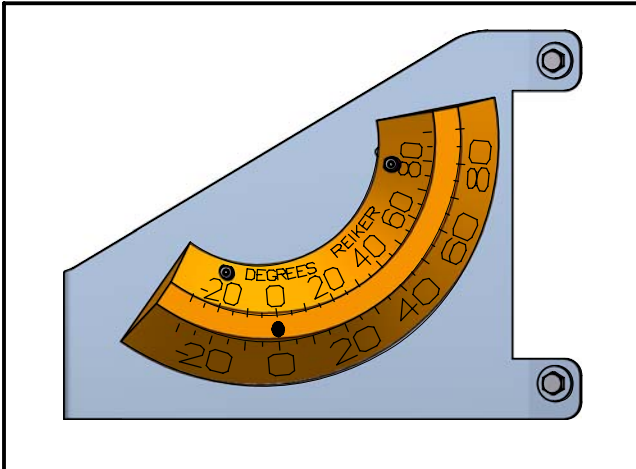


Figure 1-63
Boom Angle Indicator

Boom Angle Indicator

A bubble type boom angle indicator is mounted to the right of the operator's cab on the base section of the boom. Refer to Figure 1-63. It must be adjusted properly and the crane must be level for the unit to accurately indicate boom angles. Even under these conditions its readings are only approximate. When making near capacity lifts, measure the load radius to determine crane capacity. Check the adjustment of the boom angle indicator daily to ensure its accuracy. Refer to "Boom Angle Indicator Adjustment" in Section 3 of this Operator's Manual.

Anti-Two Block Warning System

Integrated into the Rated Capacity Limiter System is an anti-two block (ATB) warning system. An anti-two block warning system is an electromechanical system designed to alert the operator before the hook block, hook ball, or load contacts the head machinery of the main boom, auxiliary lifting sheave, or fly. When a two block situation is imminent, an audio/visual alarm is activated to alert the operator of the pending danger. When the alarm activates it is essential that the operator discontinue operations immediately, and correct the two block situation.

Three basic components are used to make up the anti-two block system. The anti-two block weight, anti-two block switch with lockout clip, and the RCL Display in the operator's cab. Refer to Figure 1-64 and Figure 1-65.

An anti-two block weight is suspended from the head machinery switch(es) where lifts are to be made and is used to hold the switch(es) in the "working" position. When the anti-two block weight is lifted by the hook block, hook ball, or load, it allows the switch to activate the audio/visual alarm on the RCL Display in the operator's cab. In addition to the audio/visual alarm, function limiters will be activated.

CAUTION

Do not allow the load to spin out of control when hoisting. The anti-two block weight may become entangled with the wire rope and could damage the anti-two block system, wire rope, or boom. Use rotation resistant wire rope during single part line hoisting applications, especially when long fall lifts are involved.

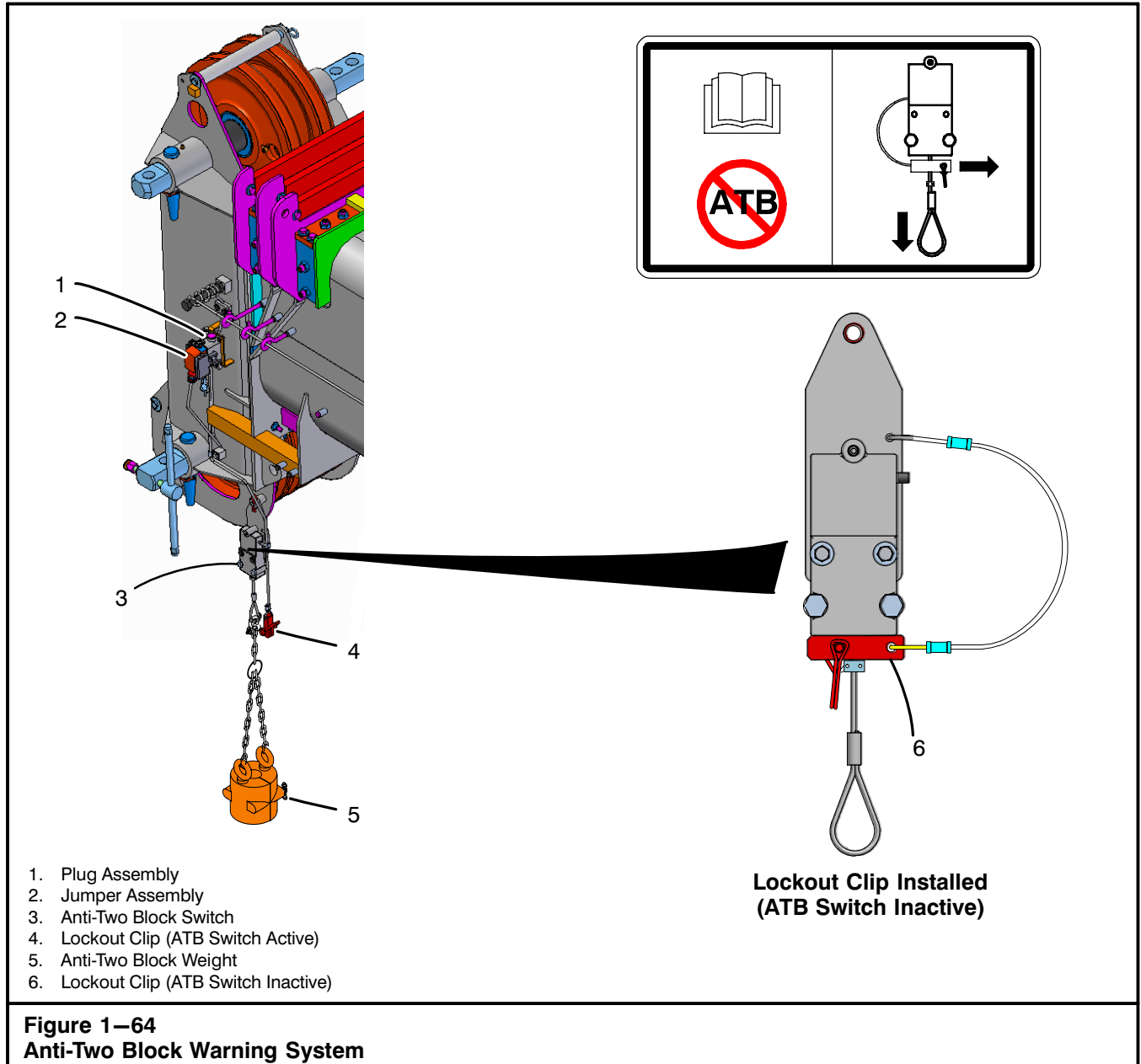
The added feature of hydraulic function limiters, prevents the operator from continuing crane functions which will cause a two block situation to occur. The crane functions of winch up, boom down, and boom extend are disabled when the anti-two block weight is lifted. These functions will remain disabled until the two block situation is corrected or the "Cancel Alarm" button on the RCL Display is pressed and held to override the system.

Note: Push the "Cancel Alarm" button momentarily once to silence the audible alarm. Press and hold the "Cancel Alarm" button for 2 seconds or longer to temporarily override the system.

The main boom head must always have an anti-two block switch. Each of the added attachments used on the crane must employ a similar head machinery switch as well, in order for that particular attachment to be monitored by the system.

The plug assembly is connected to the jumper assembly on the boom head when operating from the main boom. It is connected to the jumper assembly on the attachment when operating from that attachment.

Check that all the harness connections between the attachments are properly connected and test the system before beginning operations. Test the system by manually lifting the ATB weight and verifying that the functions of winch up, boom down, and boom extend are disabled.



Lockout Clip

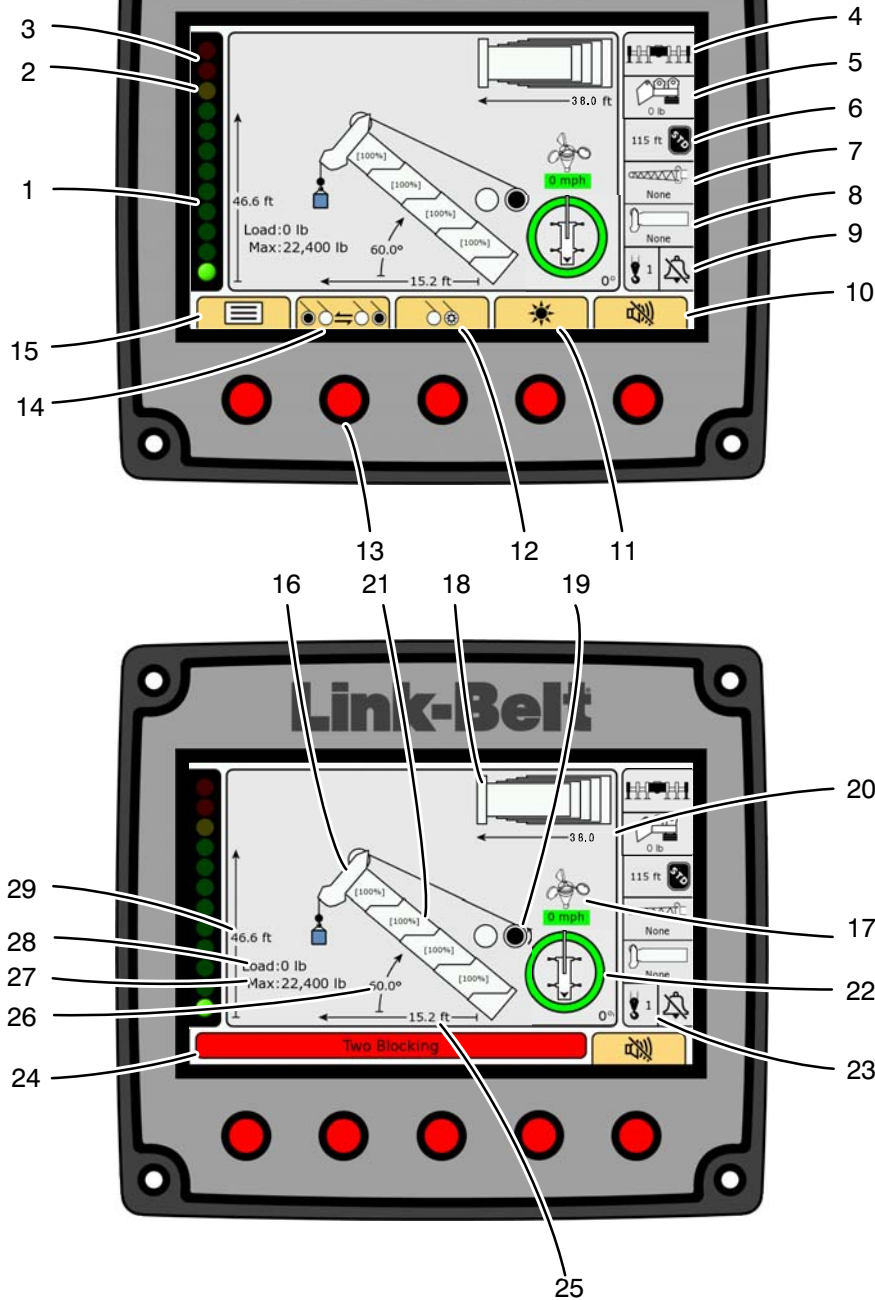
The lockout clip is used to hold the main boom anti-two block switch in the “working” position, the same as having a two block weight suspended from the switch.

When operating from the main boom the lockout clip must be removed from the anti-two block weight cable. When operating from an attachment only, the lockout clip must be installed on the anti-two block weight cable.

When both main boom and any attachment are reeved for operation, the lockout clip must be removed from the anti-two block weight cable.

Note: When using main boom and any attachment, an anti-two block weight must be suspended from the anti-two block switch on the main boom and on each attachment.

Operator's Manual



- | | | |
|---------------------------------------|---------------------------------------|------------------------------------|
| 1. Bar-Graph | 11. Brightness Icon | 21. Boom Section Length Display |
| 2. Pre-Alarm Indicator | 12. Winch Setup Icon | 22. Working Area Display |
| 3. Overload Indicator | 13. Selection Buttons | 23. Parts of Line Display |
| 4. Outrigger Configuration | 14. Winch Select Icon | 24. Warning Message Area |
| 5. Counterweight Configuration | 15. Main Menu Icon | 25. Load Radius Display |
| 6. Boom Extension Mode | 16. Crane Representation Image | 26. Boom Angle Display |
| 7. Attachment Configuration | 17. Wind Speed Display | 27. Maximum Rated Capacity Display |
| 8. Stowed Attachment Configuration | 18. Boom Telescope Animation Display | 28. Actual Load Display |
| 9. Operator Settable Alarms Indicator | 19. Drum Rotation Direction Indicator | 29. Boom Head Height Display |
| 10. Cancel Alarm Icon | 20. Boom Length Display | |

Figure 1-65
Rated Capacity Limiter

Operator's Manual

Rated Capacity Limiter

The following describes the function and operation of the Rated Capacity Limiter (RCL). The system is intended to aid the operator in the efficient operation of the crane by continually monitoring the load and warning of an approach to an overload or unsafe condition.



WARNING

Although the system will alert the operator of an approaching overload or unsafe condition, it remains the responsibility of the operator to operate the crane safely at all times.

This system must never be substituted for the good judgment of the crane operator using safe operating procedures. The operator is solely responsible for safe operation of the crane.

!!THIS SYSTEM IS AN OPERATOR'S AID – NOT A SAFETY DEVICE!!

System Description

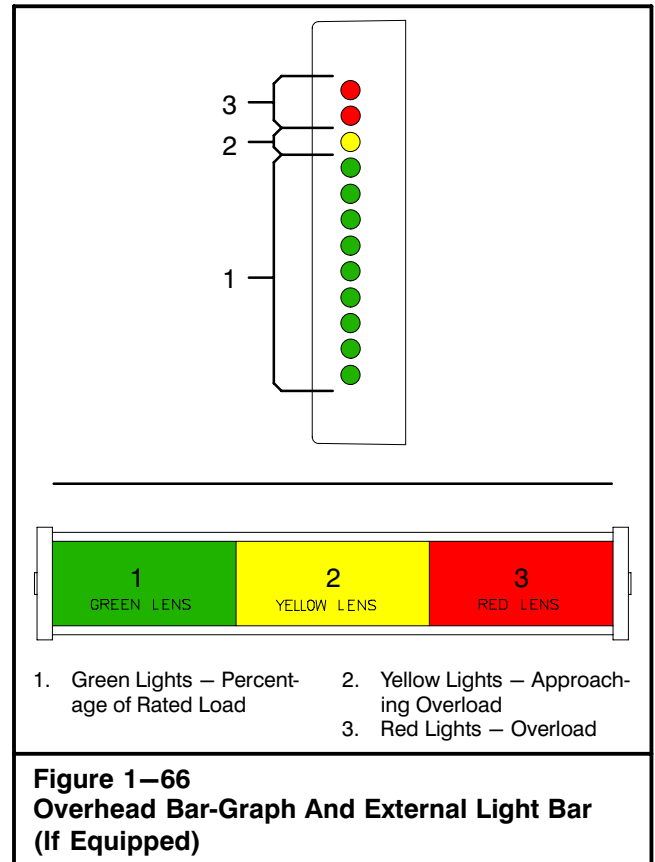
The system monitors crane functions by means of high accuracy sensors and continuously compares the load with a copy of the crane capacity chart which is stored in the computer memory. If an overload is approached, the system warns by means of audible and visual alarms and is configured to cause function limitation.

The Rated Capacity Limiter provides the operator with a continuous display of:

- Rated Capacity
- Actual Load
- Radius of the Load
- Angle of the Main Boom
- Crane Configuration
- Length of the Main Boom
- Height of the Main Boom Head Above the Carrier Deck

Note: The function of the RCL System is an operational aid to warn or to indicate to the operator when the load being lifted approaches, meets, or exceeds the rated capacity of the crane. The RCL System does not function as a scale or weighing device.

The actual load displayed by the RCL System is less accurate when the actual load lifted is a small percentage of the allowable load. This typically occurs when lifting light loads with a short boom length at high boom angles. Crane configurations of this type produce low pressures in the boom hoist cylinder resulting in less accuracy of the RCL sensors and calculated load. The RCL load accuracy improves greatly when the actual load lifted approaches the rated load (higher boom hoist cylinder pressures).



An additional feature of the system is the provision of operator settable alarms. These alarms, when properly set, provide a method of obstacle avoidance. This is achieved by means of maximum boom length, maximum boom angle, maximum load radius, maximum boom head height, left and right swing, and defined area alarms. These alarms can be programmed for each job site and set rapidly for the prevailing site conditions thereby aiding the operator in safe operation of the crane.

Display Unit

The following is a description of the control buttons, indicators, and windows on the display unit. Use them along with Figure 1-65.

1. Bar-Graph

The Bar-Graph is a series of twelve colored lights which gives a visual indication of how much of the crane's capacity is being used and the rate at which an overload is being approached. Each green light represents 10% of the crane's rated capacity being used. Yellow indicates 90–99.9%, and the red lights indicate an overload.

Note: System may be equipped with an overhead bar-graph or an external light bar which operates similar to the bar-graph on the display. Refer to Figure 1-66.

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2. Pre-Alarm Indicator

The Pre-Alarm Indicator illuminates yellow at a pre-set value of 90% of Maximum Rated Capacity and provides a visual indication of an approach to an overload.

3. Overload Indicator

The Overload Indicator illuminates red at a pre-set value of 100% of the Maximum Rated Capacity and provides a visual indication of Maximum Allowed Load. It will also illuminate whenever a wire rope limit is exceeded. Function limiters will occur simultaneously for an Overload, Wire Rope Limit, or a Two-Block condition, but function limiters will not occur when exceeding an Operator Settable alarm. An audible alarm will sound and a message will appear in the warning message area for all these conditions.

4. Outrigger Configuration

This area displays the current outrigger configuration. It will also display rigging and travel modes.

5. Counterweight Configuration

This area displays the current counterweight configuration.

6. Boom Extension Mode

This area displays the current boom extension mode. It also shows the maximum boom length for the current boom extension mode.

7. Attachment Configuration

This area displays the current attachment configuration.

8. Stowed Attachment Configuration

This area displays the current stowed attachment configuration.

9. Operator Settable Alarms Indicator

This indicator will display whether or not an Operator Settable alarm is set.

10. Cancel Alarm Icon

The button directly below this icon can be pushed once to silence the audible alarm when the alarm has occurred as a result of either an Overload, a Two Block, or an Operator Settable alarm. It is also used to reset the function limit relay when it is necessary to bypass a function limit which has occurred as a result of either an Overload or a Two Block alarm. This requires the button be pressed and held for 2 seconds or longer.

11. Brightness Icon

The button directly below this icon is used to adjust the display brightness.

12. Winch Setup Icon

The button directly below this icon is used to enter the active winch setup screen. The active winch setup screen allows the user to configure lift point and parts of line for the active winch.

13. Selection Buttons

The selection buttons are used to activate each of the icons at the bottom of the screen. The icons will change depending on the current menu display.

14. Winch Select Icon

The button directly below this icon is used to select which winch will be in use.

15. Main Menu Icon

The button directly below this icon navigates to the main menu. The main menu contains items such as: Crane Configuration, Operator Alarms, Diagnostics, Setup, About, etc.

16. Crane Representation Image

This crane representation image is a generic representation of the boom, active winch configuration, auxiliary head configuration (on or off), and fly configuration (on or off). The attachment image will not change with an installed attachment.




17. Wind Speed Display

The current wind speed is displayed here.

18. Boom Telescope Animation Display

The Boom Telescope Animation Display is a real-time visual representation of the location of the boom sections.

19. Drum Rotation Direction Indicator (DRDI)

This Drum Rotation Direction Indicator is used to monitor Winch Up , Winch Down , and Error states .

Note: If the error state indicator appears, contact your Link-Belt Distributor or Factory for service.

20. Boom Length Display

The Boom Length Display gives a continuous indication of the boom length in feet (*m*). It is the distance

from the centerline of the boom foot pin to the centerline of the boom head machinery.

21. Boom Section Length Display

The Boom Section Length Display shows the current section lengths as a percentage of their absolute maximum length (not in the current boom mode). The maximum length for each section in the current boom mode is shown in brackets.

22. Working Area Display

This area displays a graphical representation of the allowable lifting quadrant(s) based on the selected configuration. A quadrant not allowed will be filled red, an allowable quadrant will be filled green.

23. Parts of Line Display

The Parts of Line Display shows the parts of line currently selected for the winch in use.

24. Warning Message Area

The Warning Message Area displays text messages of various alarms which may occur during normal operation of the system. When an alarm occurs, the rectangular area fills in red. The Warning Message Area will only be shown when there is an active message. Otherwise the navigation button icons will be shown. Refer to Figure 1–68. Press any of the selection buttons, except the cancel alarm button, to temporarily replace the Warning Message Area with the navigation button icons.

25. Load Radius Display

The Load Radius Display gives a continuous indication of the radius of the load in feet (*m*). It is the horizontal distance from the centerline of rotation to the centerline of the hook.

26. Boom Angle Display

The Boom Angle Display gives a continuous indication of the angle of the main boom relative to horizontal.

27. Maximum Rated Capacity Display

The Maximum Rated Capacity Display is a digital display of the maximum permitted capacity. It is derived from a copy of the crane's capacity chart which is stored in the computer memory and is the reference capacity for any lifting operation. It is dependent on the configuration currently selected, which is shown in the crane configuration screen, and which determines the section of the capacity chart to be used as the rated capacity reference.

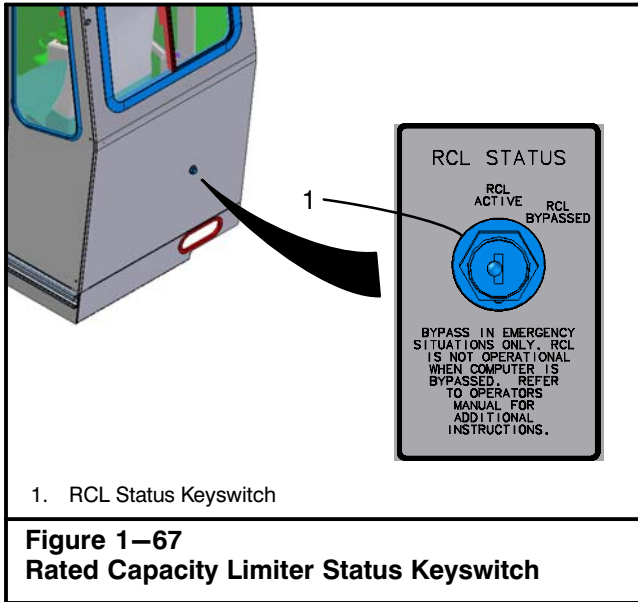
28. Actual Load Display

The Actual Load Display is a digital display of the total load suspended below the boom or fly head. It includes the load, any slings, pins, or tackle used to secure the load and the hook block or hook ball.

29. Boom Head Height Display

The Boom Head Height Display gives a continuous display of the height of the boom head or attachment head above the carrier deck.

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System Operation

The following is a list of procedures which are used to operate the multiple features of the Rated Capacity Limiter. Use these procedures in conjunction with the previous display unit control descriptions.

System Bypass

In emergency situations, the Rated Capacity Limiter computer can be bypassed. There is a RCL Status keyswitch on the back of the operator's cab, to bypass the system. Refer to Figure 1-67. Move the key to the "RCL BYPASSED" position to bypass the system. For emergency use while the system is bypassed, refer to "System Inoperative or Malfunctioning" in this Section of this Operator's Manual.



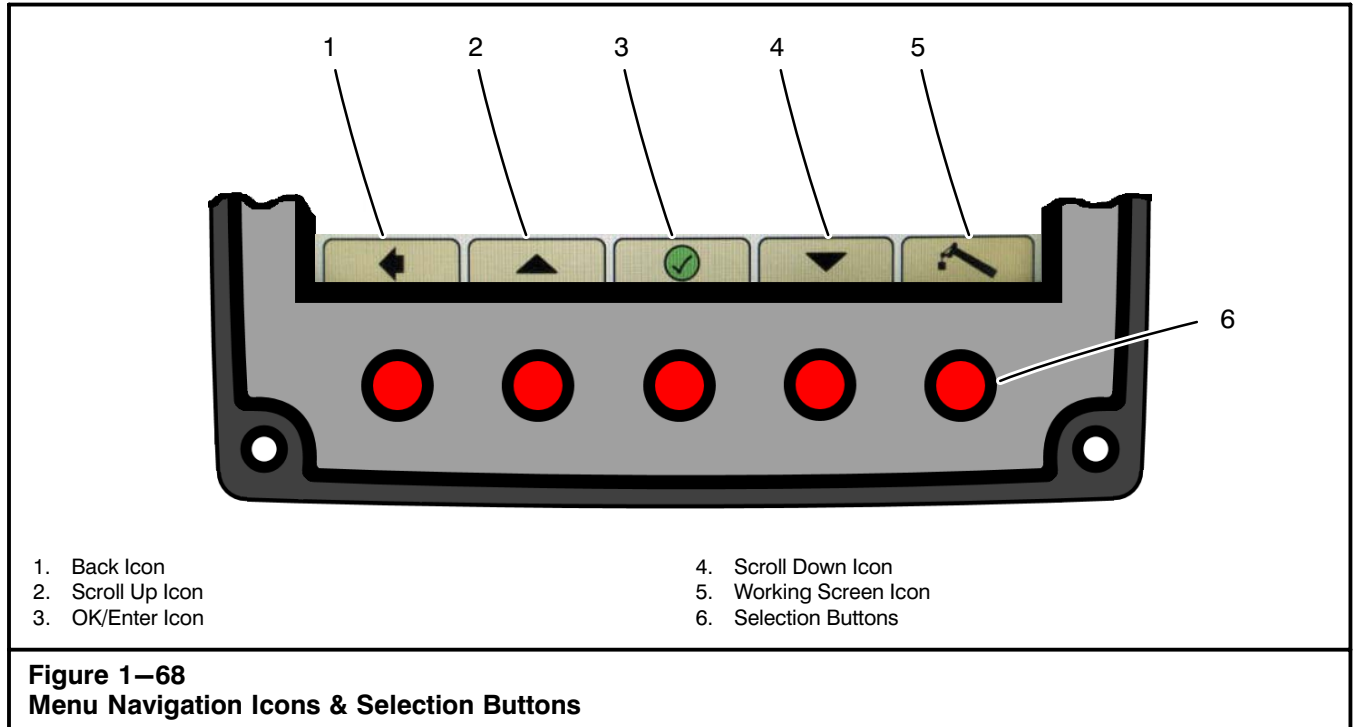
WARNING

The RCL System is not operational when the computer is bypassed. Bypass the system in emergency situations only.

System Inoperative Or Malfunctioning

When operational aids are inoperative or malfunctioning, the following recommendations for continued use of the crane should be followed or the crane should be shutdown.

1. Steps shall be taken to schedule repairs and recalibration immediately. The operational aids shall be put back into service as soon as replacement parts, if required, are available and the repairs and recalibration can be carried out. Every reasonable effort must be made to expedite the repairs and recalibration.
2. When the Rated Capacity Limiter is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish procedures for determining load weights and shall ensure that the weight of the load does not exceed the crane ratings at the radius where the load is to be handled.
3. When a boom angle or radius indicator is inoperative or malfunctioning, the radius or boom angle shall be determined by measurement.
4. When the anti-two block warning device is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish procedures, such as assigning an additional signal person, to furnish equivalent protection. This does not apply when lifting personnel in load line supported work platforms. Personnel shall not be lifted in load line supported work platforms when the anti-two block devices are not functioning properly.
5. When a boom length indicator is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish the boom length at which the lift will be made by actual measurement or markings on the boom.
6. When a level indicator is inoperative or malfunctioning, other means shall be used to level the crane.
7. In situations where inconsistency exists, verified weights, measured radii, boom lengths, and authorized crane capacities must always take precedence over indicator readings.



System Navigation

The RCL Display has two main display modes; the working screen and the menu. The working screen displays all information relevant to the safe operation of the crane. This includes crane configuration as well as live data such as boom length and load radius. The menu is used to navigate to various setup and diagnostic screens needed to properly setup the system. Although the five navigation icons at the bottom of the screen will change depending on what the display is currently showing, the five primary icons for menu navigation are as follows. Refer to Figure 1–68. If a task associated with a button is not available, that button will be disabled and greyed out.

1. Back Icon

The selection button directly below the Back Icon navigates back one menu.

2. Scroll Up Icon

The selection button directly below the Scroll Up Icon scrolls up one menu item each time it is pressed.

3. OK/Enter Icon

The selection button directly below the OK/Enter Icon selects the menu item currently highlighted.

4. Scroll Down Icon

The selection button directly below the Scroll Down Icon scrolls down one menu item each time it is pressed.

5. Working Screen Icon

The selection button directly below the Working Screen Icon immediately navigates to the working screen when it is pressed.

6. Selection Buttons

These buttons are used to select the function of the icon displayed above them.

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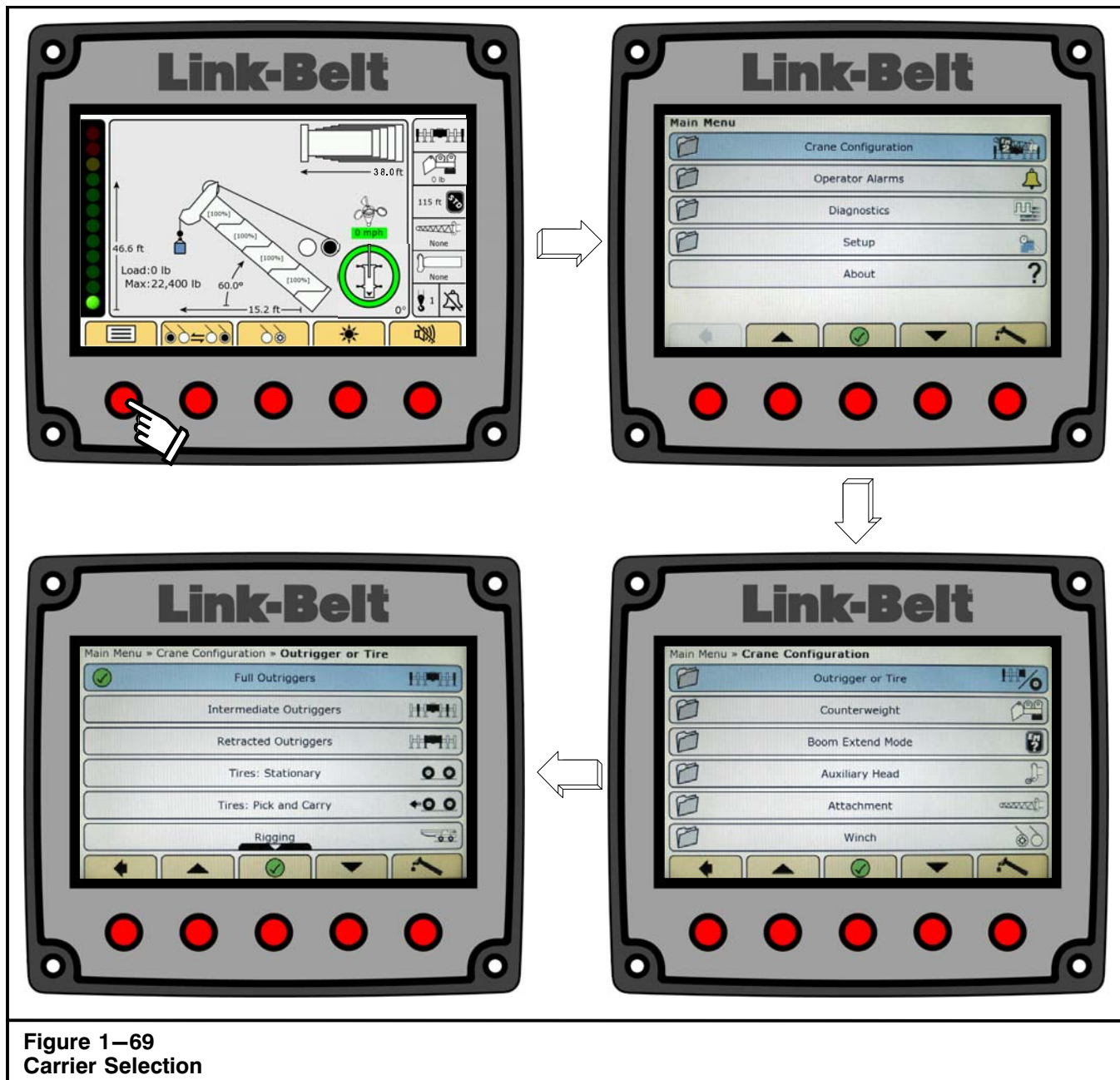





Figure 1-69
Carrier Selection

Configuration Selection

In the normal operational mode the system is programmed to remember the last configuration selected. Each time the system is powered up it will automatically default to that last configuration. Only when the crane is rigged differently must a new configuration be selected. Use the following procedure to select the crane configuration.

Note: When selecting configurations allowed on outriggers, all beams must be equally extended; all fully retracted, intermediate extended, or fully extended.

Depending on how the crane is equipped or which selections have been made, some screens shown may not appear or may not appear as illustrated. The system cannot be programmed for configurations not allowed by the capacity charts in the Crane Rating Manual.

1. From the normal working screen, press the Main Menu button . Refer to Figure 1-69.
2. Scroll to Crane Configuration, and press the OK/Enter button .
3. Scroll to Outrigger or Tire, and press the OK/Enter button .

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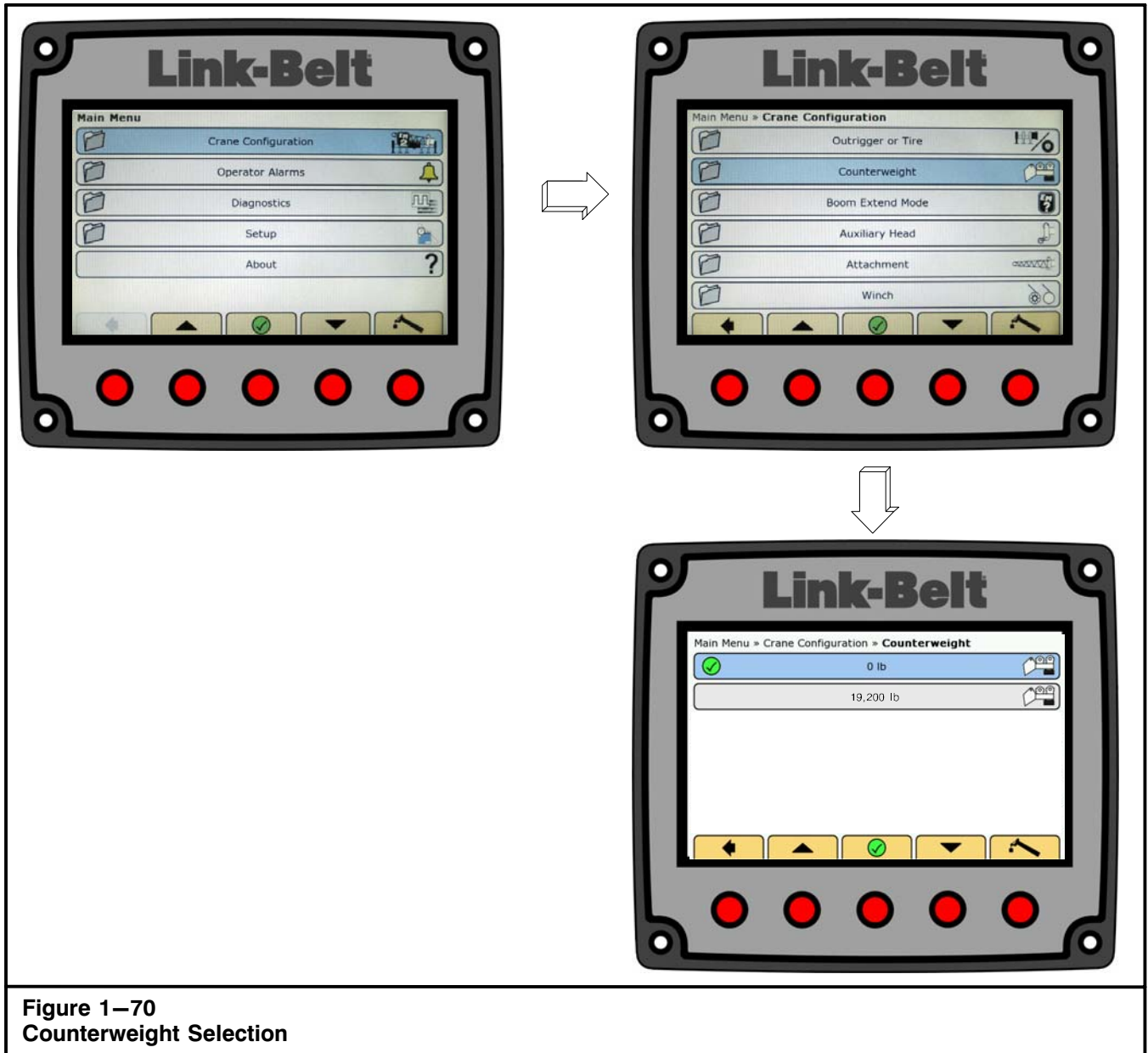


Figure 1–70
Counterweight Selection

4. The menu will change and graphically display the carrier options. Scroll to the desired carrier configuration, and press the OK/Enter button . If rigging is desired, refer to “To Select Rigging And Travel Modes” in this Section of this Operator’s Manual.
5. After a selection is made, the display will return to the Crane Configuration menu.
6. On the Crane Configuration menu, scroll to Counterweight, and press the OK/Enter button . Refer to Figure 1–70.
7. Scroll to the desired counterweight, and press the OK/Enter button .
8. After a selection is made, the display will return to the Crane Configuration menu.



WARNING

The RCL System is not operational when in the Rigging or Travel Modes. Return the RCL System to normal operation before operating the crane.

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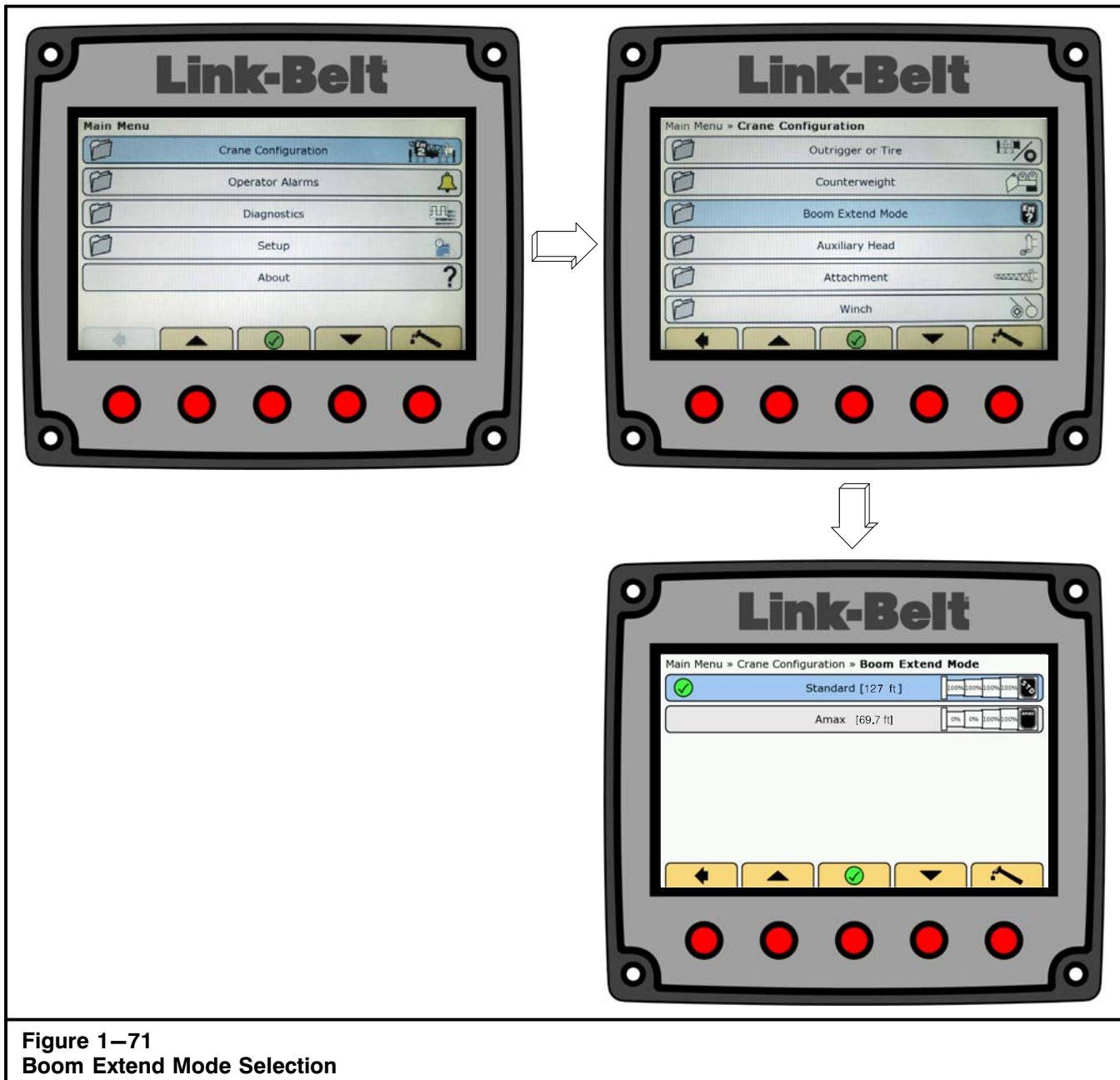




Figure 1–71
Boom Extend Mode Selection

9. On the Crane Configuration menu, scroll to Boom Extend Mode, and press the OK/Enter button .
Refer to Figure 1–71.
10. Scroll to the desired boom extend mode, and press the OK/Enter button .

Note: Refer to the Crane Rating Manual to determine the best boom mode to maximize lifting capacity at working radius. Boom mode options will only be displayed when the boom is fully retracted.

11. After a selection is made, the display will return to the Crane Configuration menu.

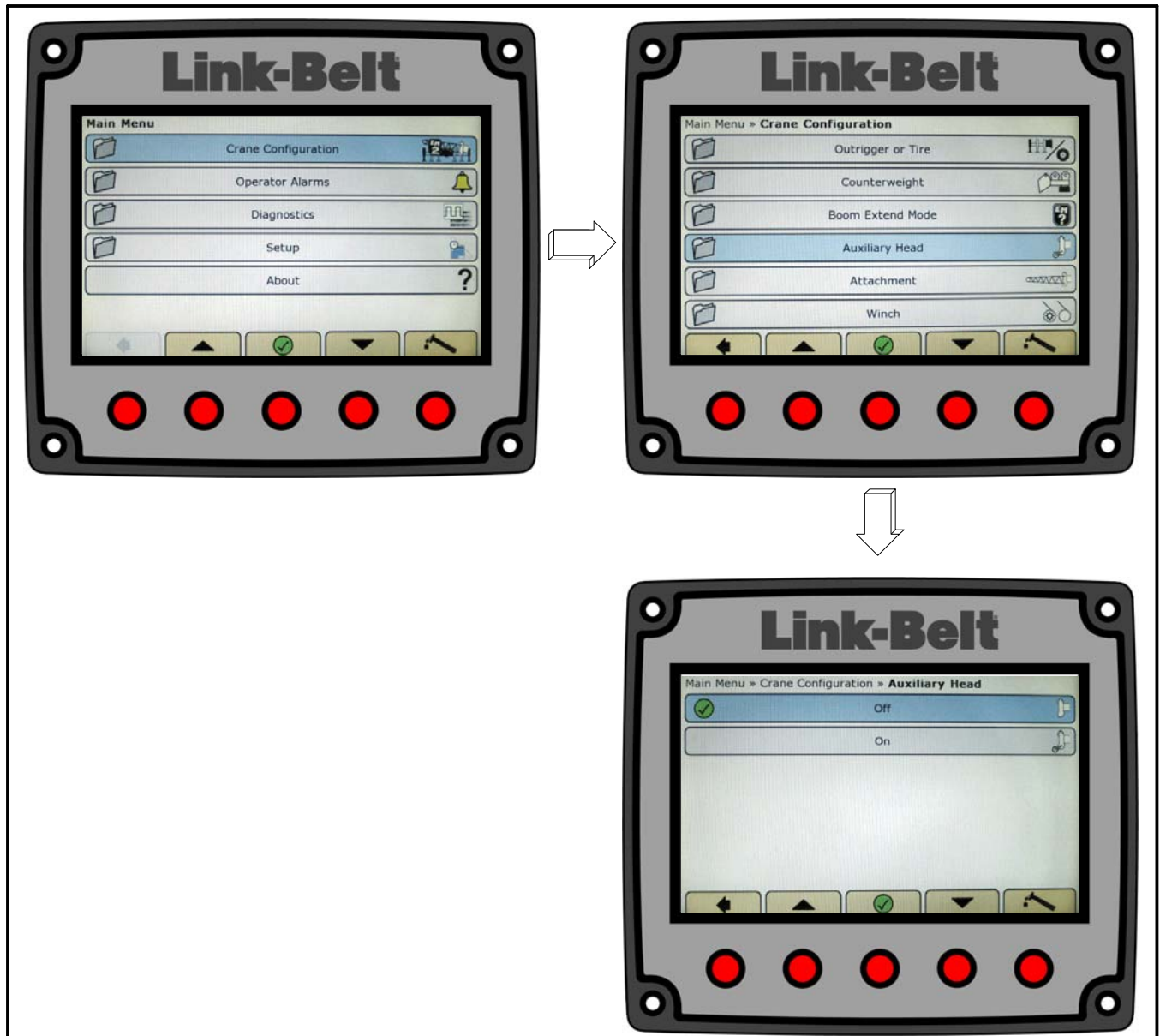


Figure 1–72
Auxiliary Head Selection

12. On the Crane Configuration menu, scroll to Auxiliary Head, and press the OK/Enter button . Refer to Figure 1–72.
13. Scroll to the desired auxiliary head (off or on), and press the OK/Enter button .
14. After a selection is made, the display will return to the Crane Configuration menu.

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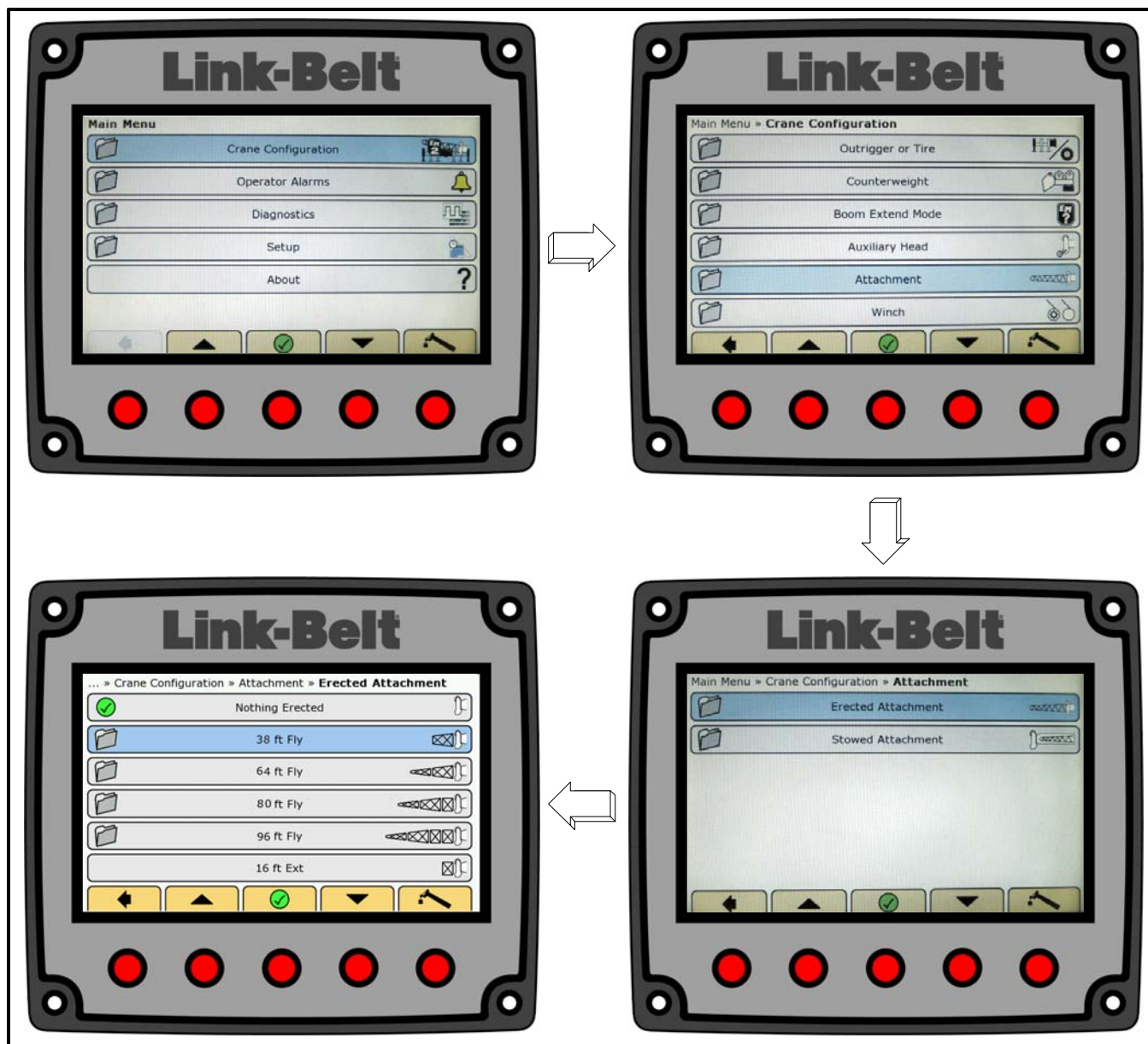


Figure 1–73
Erected Attachment Selection

15. On the Crane Configuration menu, scroll to Attachment, and press the OK/Enter button . Refer to Figure 1–73.
16. Scroll to Erected Attachment, and press the OK/Enter button to display the fly options. Scroll to the desired erected fly, if required, and press the OK/Enter button .
- a. If Nothing Erected is selected, the display will return to the Crane Configuration menu.
- b. If an erected attachment is selected, the display will change and graphically display the available offsets as required. Refer to Figure 1–74.
- c. Scroll to the desired offset angle, and press the OK/Enter button .
- d. After a selection is made, the display will return to the Crane Configuration menu.

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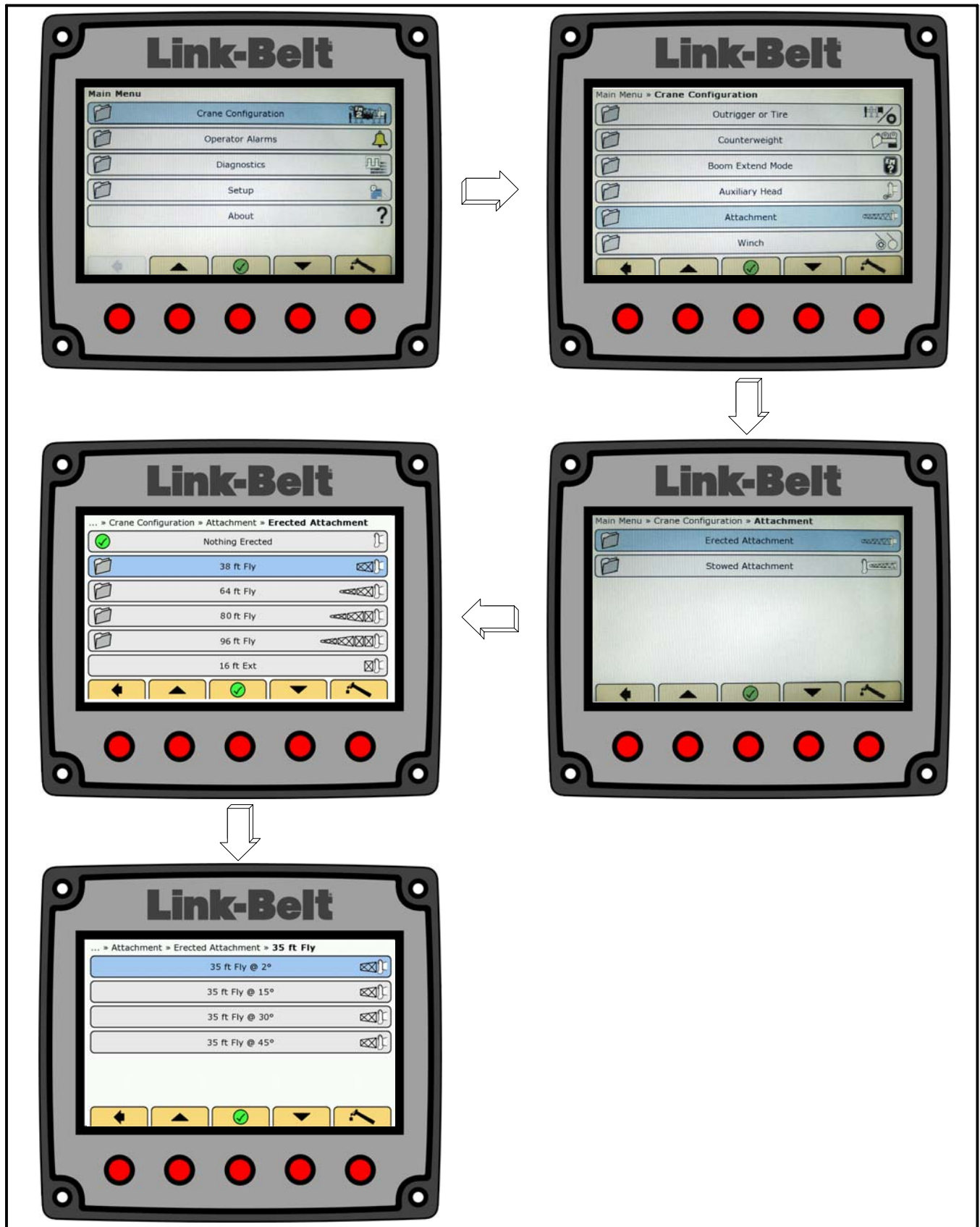


Figure 1–74
Erected Attachment Selection

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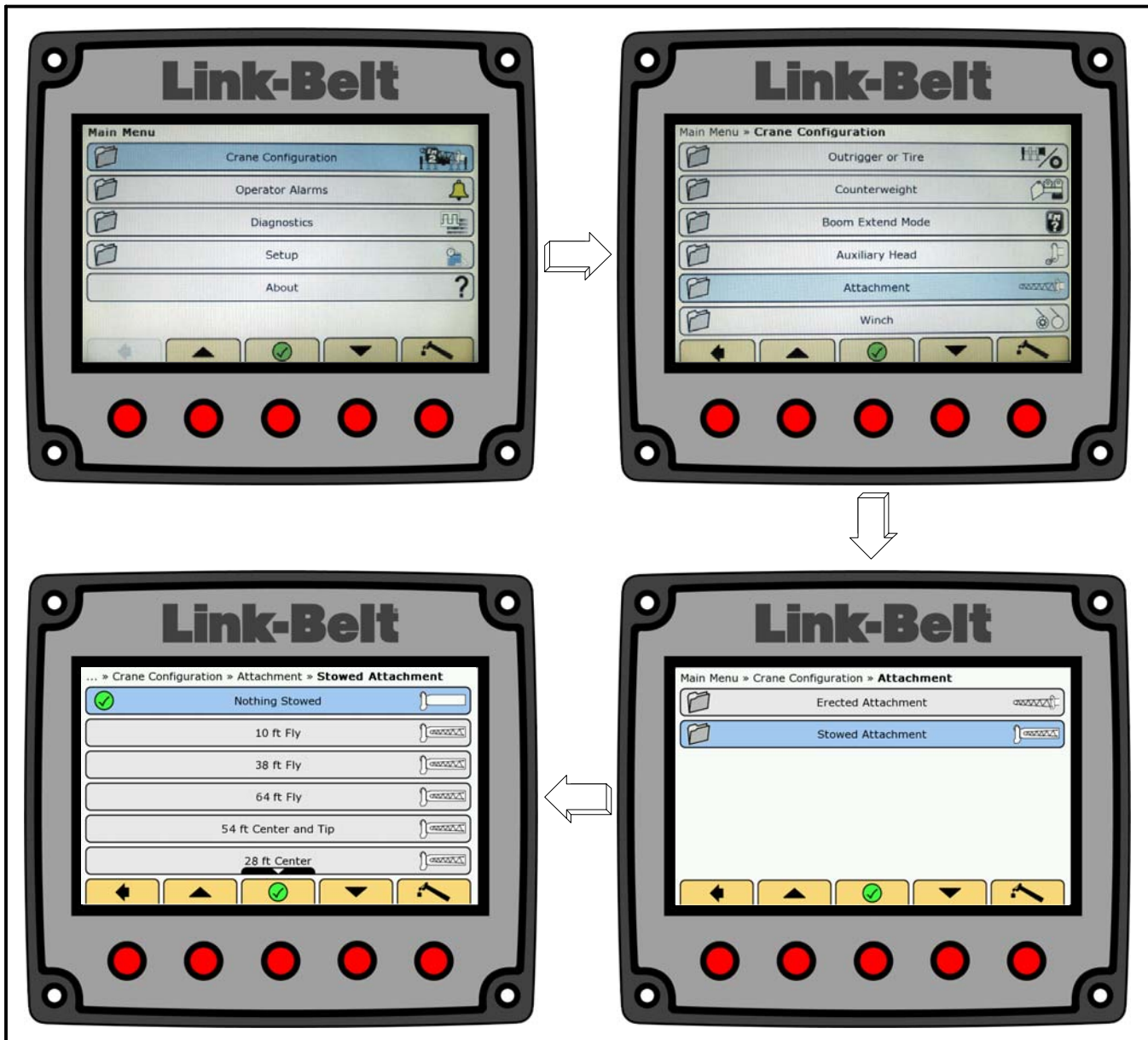


Figure 1–75
Stowed Attachment Selection

17. If the crane is equipped with a fly and was not selected as an erected attachment, on the Crane Configuration menu, navigate to Attachment, then to Stowed Attachment to display the stowed fly options. Scroll to the desired stowed deduct, if required, and press the OK/Enter button . Refer to Figure 1–75.

18. After a selection is made, the display will return to the Crane Configuration menu.

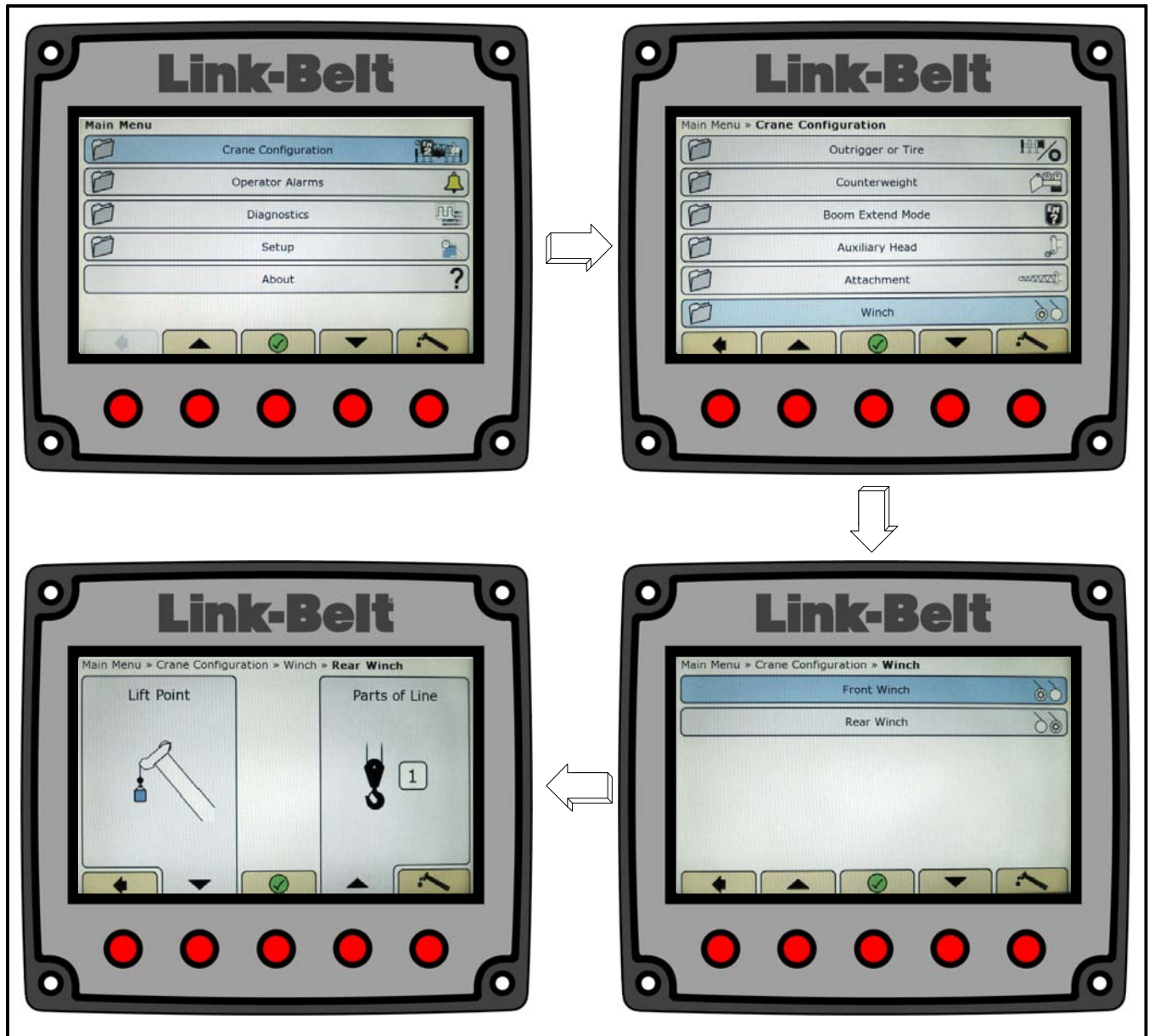




Figure 1–76
Winch Configuration

19. On the Crane Configuration menu, scroll to Winch, and press the OK/Enter button  to display the front and rear winch. Refer to Figure 1–76.

a. Scroll to the desired winch menu item, and press the OK/Enter button . This will only configure the selected winch. The winch select button on the working screen is used to change the active winch.

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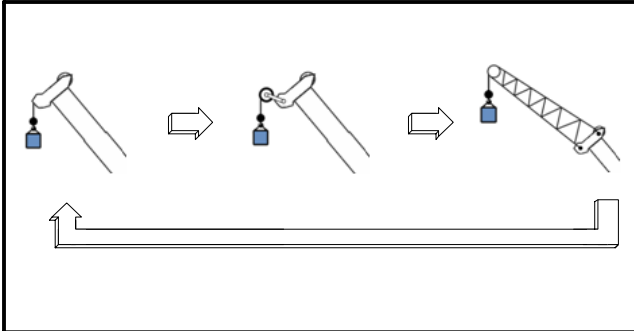






Figure 1-77
Lifting Point Selection

- b. Scroll through the available lifting points until the desired lifting point, for the winch selected, is displayed. Refer to Figure 1-77.
- c. Scroll through the available parts of line until the desired parts of line, for the winch selected, is displayed. Refer to Figure 1-78.
- d. Press the OK/Enter button  to confirm the selections for lifting point and parts of line. If the back button  or working screen button  is pressed before pressing the OK/Enter button , the changes made to lifting point and parts of line will not be saved.
- e. Repeat Steps a through d for the other winch, if required.

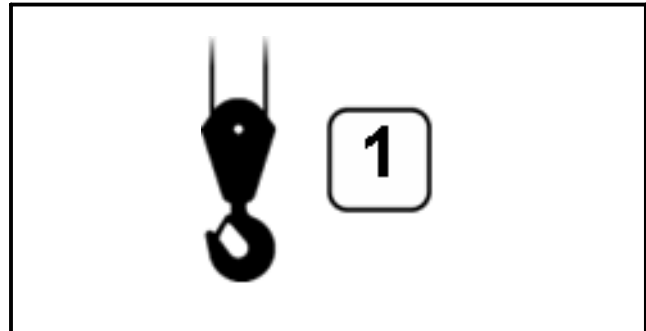




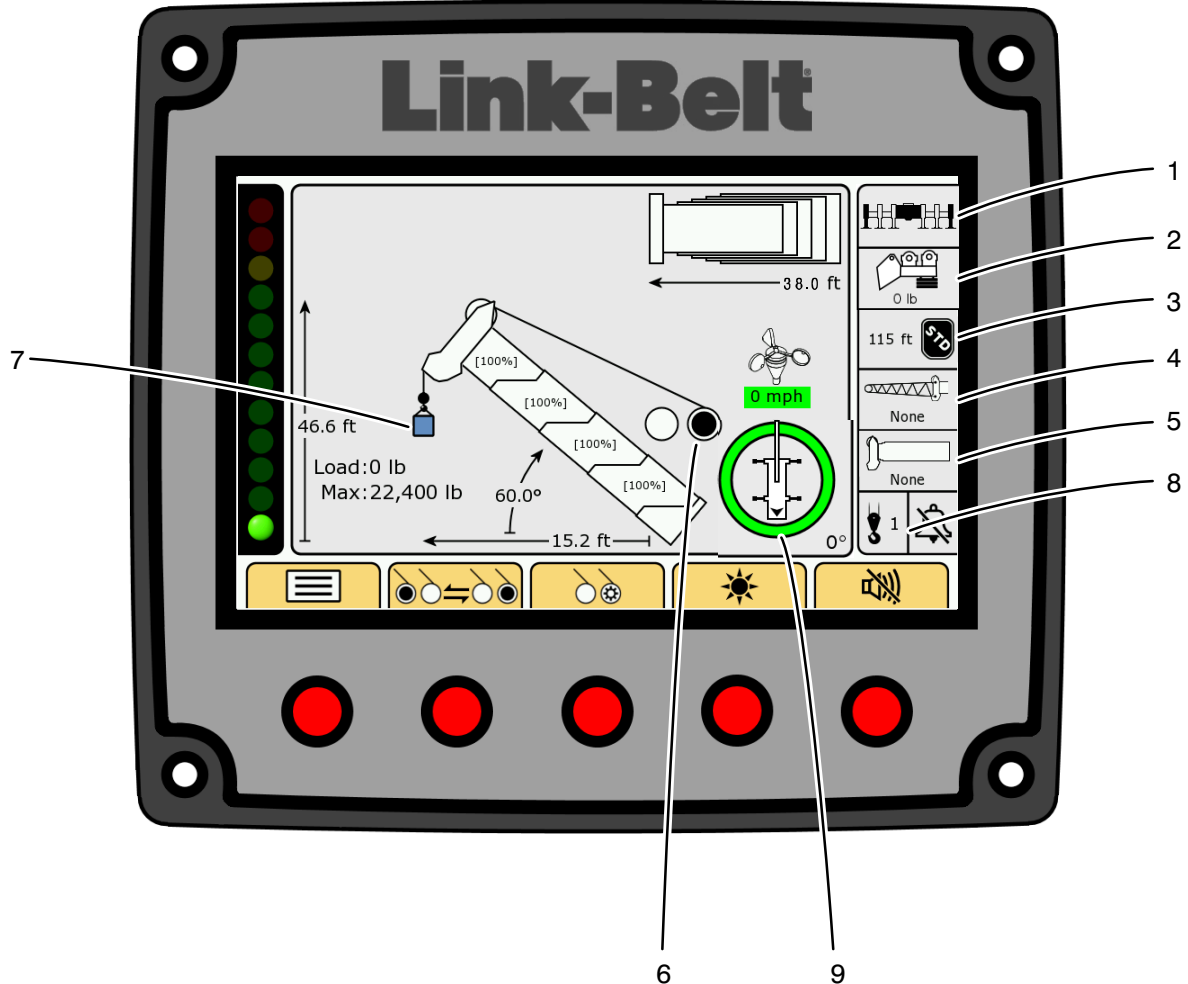
Figure 1-78
Parts Of Line Selection

20. Press the back button  to navigate back to the Crane Configuration menu.

Note: A change to any selection can be made at anytime during the configuration routine. When on the Crane Configuration menu, simply navigate to the desired configuration menu to go directly to that sub-routine.

21. Press the Working Screen button  to return to the normal working screen and graphically display the crane configuration as previously selected.

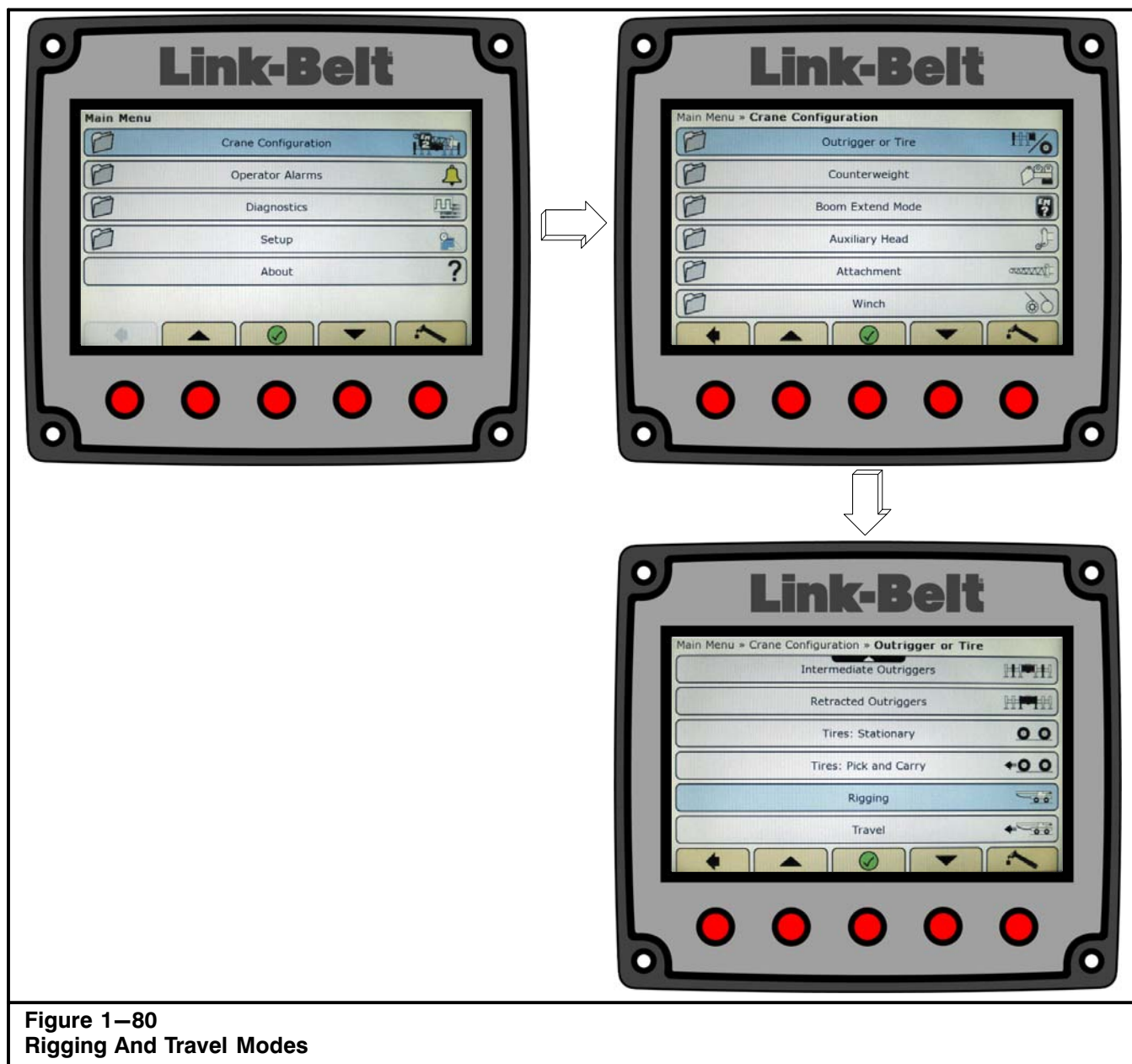
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In this example the crane is setup on fully extended outriggers (1), 0 lb of counterweight (2), boom mode STD (standard) (3), no fly installed (4), no stowed attachment (5), the front winch available with the fly and the rear winch selected (6), with the winch wire rope reeved over the main boom head (7), with one part of line (8), and 360 degree capacities with the boom currently positioned over the rear (9).

Figure 1–79
Normal Working Screen Example

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To Select Rigging And Travel Modes

The Rigging and Travel modes are used to facilitate rigging and travel of the crane by inhibiting function limiters and the audible alarm while selected. Refer to Figure 1–80. To resume crane operation, select proper outrigger or tire configuration per the proper procedure.



WARNING


The RCL System is not operational when in the Rigging or Travel modes. Return the RCL System to normal operation before operating the crane.

1. From the normal working screen, press the Main Menu button .
2. Navigate to Crane Configuration, then to Outrigger or Tire.
3. Scroll to Rigging or Travel.
4. Select Rigging  for rigging of the crane. Select Travel  for traveling the crane.

Note: Boom must be fully retracted to enter Travel Mode.

When changing from Travel Mode to Rigging Mode, an outrigger selection and boom mode selection must be made prior to selecting Rigging mode.

Cancel Audible Alarm And Reset Function Limiters

The CANCEL ALARM button  is used to cancel the audible alarm when the alarm has occurred as a result of either an Overload, a Two Block alarm, or an Operator Settable alarm. The audible alarm may be canceled by pressing and releasing the CANCEL ALARM button. The audible alarm remains canceled until the condition which caused the alarm has been removed. For example, if the audible alarm was canceled because of an overload condition, it will remain canceled until the overload condition is removed. However, if a different alarm, e.g. two block condition, was to occur when the audible alarm was still canceled for an earlier overload condition, the new alarm condition would cause the audible alarm to sound.



WARNING

Once the function limiters have been bypassed, the crane is no longer protected against the condition that initially caused the function limiters to occur.

Note: The CANCEL ALARM feature is a temporary function. The audible alarm or function limit is automatically reset when the condition which caused the alarm is no longer present.

The CANCEL ALARM is also used to reset the function limiters when it is necessary to bypass the function limiters which has occurred as a result of either an Overload, a Two Block alarm, or a Rope limit. Function limiters are reset by first canceling the audible alarm (as described above) and then pressing and holding the CANCEL ALARM button for about 2 seconds, after which the function limiters will be reset to allow operation. However, should another different alarm condition occur when the function limiters had previously been over-ridden, then the newly occurring alarm condition would cause the function limiters to occur again.

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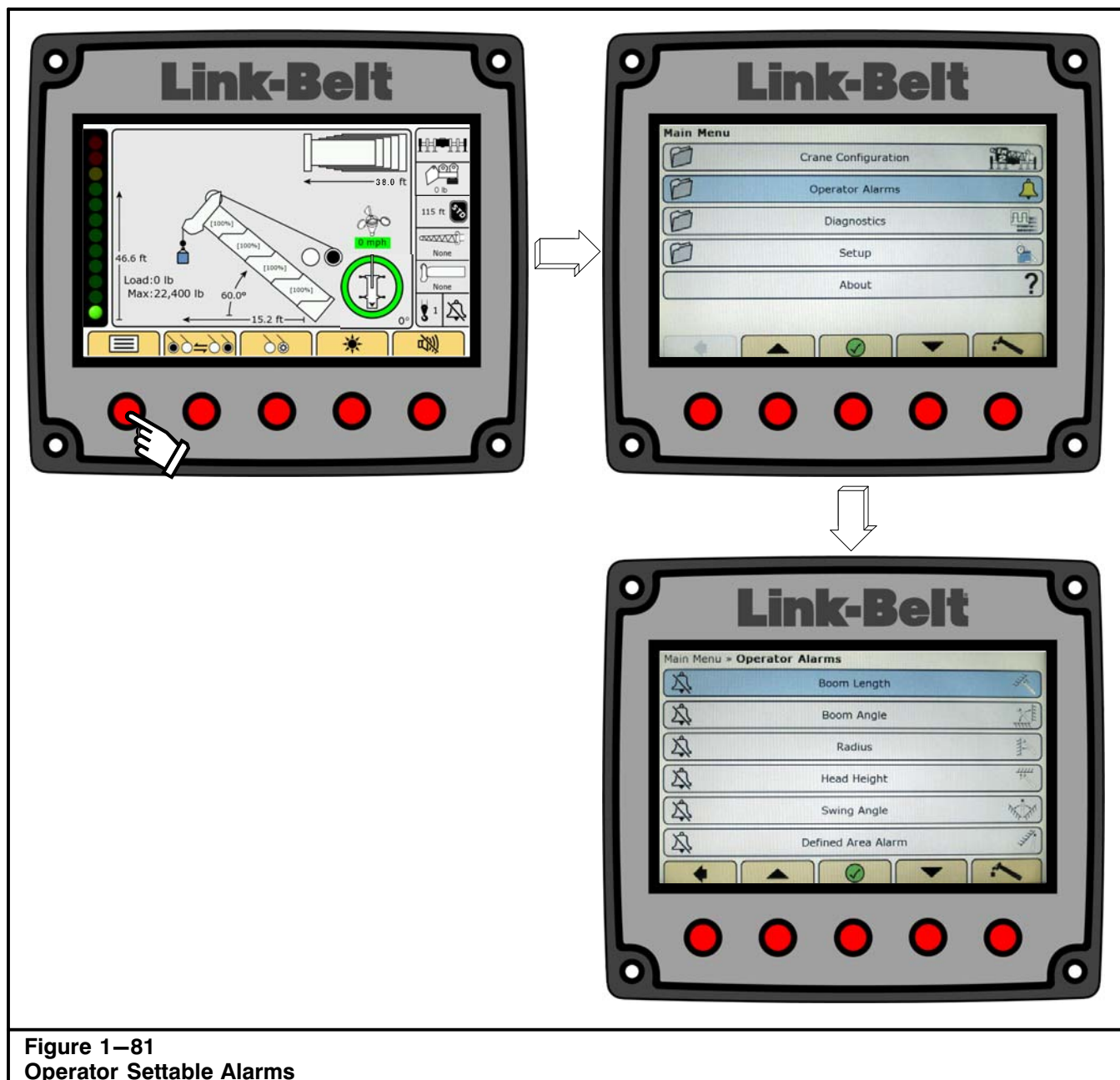


Figure 1-81
Operator Settable Alarms

Operator Settable Alarms

Some alarms occur automatically as a result of limitations imposed by the capacity chart. The operator has control over additional alarms (Operator Settable) which can be set to operate within the normal chart limitations which are in addition to those already set by the chart.

Operator Settable alarms will be stored in the computer memory, even if the crane is shutdown, until they are disabled. Refer to Figure 1-81.

The following alarms are available for operator use.

Minimum Angle	Maximum Load Radius	Left and Right Swing
Maximum Angle	Maximum Boom Length	
Maximum Height	Operator Defined Area	



WARNING

The Operator Settable Alarms are a warning device. All functions remain operational when entering the operator defined bad area. For safe operation, adequate distance must be maintained to allow for operator reaction time to avoid entering the bad area. It is the responsibility of the operator to set points which ensure that the crane's boom, attachment, load, rigging, etc. maintains a safe working distance and complies with local safety regulations.

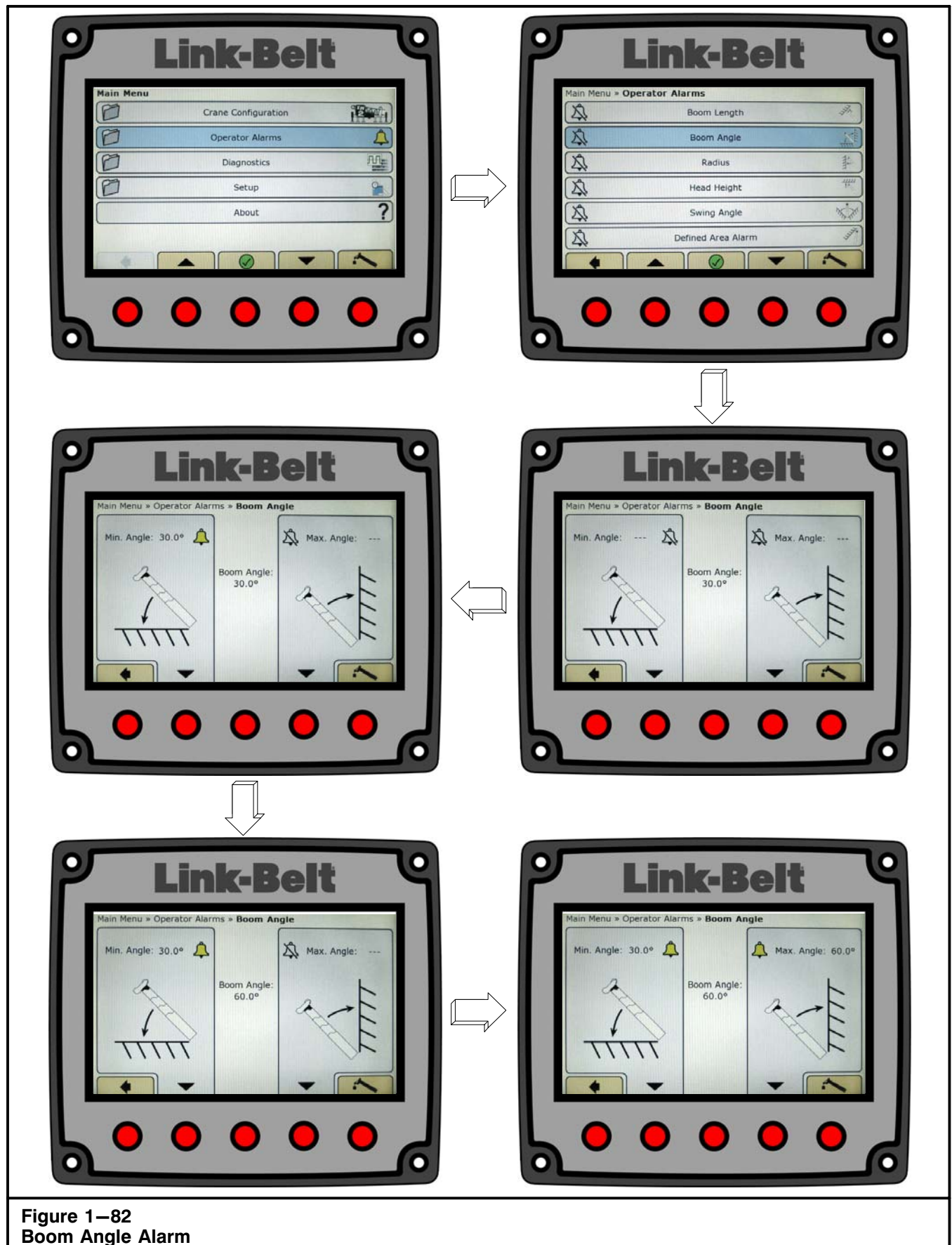





Figure 1–82
Boom Angle Alarm

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Setting Angle, Length, Height, Radius, And Swing Operator Alarms

1. From the normal working screen, press the Main Menu button .
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1–81.
3. Scroll to the desired alarm to be set, and press the OK/Enter button . Refer to Figure 1–82.







WARNING



Avoid positioning the boom, attachment, load, rigging, etc. into the bad area when setting the alarm values.

When selecting the alarm values, ensure that the load will maintain a safe distance from the obstacle.

4. Place the crane in the desired position depending upon the alarm to be set. The numerical value for the value being set will be the current position of the crane.

Note: If an alarm had been previously set, the alarm value displayed will be the previously set alarm value and indicated by the  icon. The previous alarm must first be disabled, then set the new alarm. Alarms which are disabled are indicated by the .

5. Press the corresponding selection button to set the alarm value.
6. Press the back button  to return to the Operator Alarms menu or press the Working Screen button  to return to the normal working screen.
7. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching the alarm set point, the audible alarm will sound intermittently and a warning message will appear in the warning message area. When exceeding the alarm set point, the audible alarm will sound continuously and a warning message will appear in the warning message area.

Note: An alarm icon  will appear on the normal working screen to alert the operator that an Operator Settable alarm has been set. If no Operator Settable alarm is set, the alarm disabled icon  will appear.

8. Use the following examples to understand the use of the procedure.



WARNING

If crane or obstacle is moved or if a different size load is lifted, the alarm(s) must be reset.










WARNING

Check the crane's current configuration, capacity chart, and Working Areas Chart in the Crane Rating Manual to ensure safe, stable operation under conditions described in the following examples.

To Set Minimum Angle Alarm

Example: To have an alarm whenever the boom is below a 30 degree angle, use the following procedure:

1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1–82.
3. Scroll to Boom Angle , and press the OK/Enter button .
4. Position the boom to a 30 degree angle.
5. Press the corresponding button for "Min. Angle" to set the alarm. The displayed value will be the alarm setting. The  will appear to indicate that the alarm is set.
6. Press the back button  to return to the Operator Alarms menu or press the Working Screen button  to return to the normal working screen.
7. Test the alarm, with no load, to ensure the alarm points have been properly set. When lowering the boom and approaching 30 degree boom angle, the audio will sound intermittently and "Approaching Minimum Angle" will appear in the warning message area. The audible alarm will sound continuously and "Minimum Angle" will appear in warning message area whenever the boom is lowered below 30 degrees.

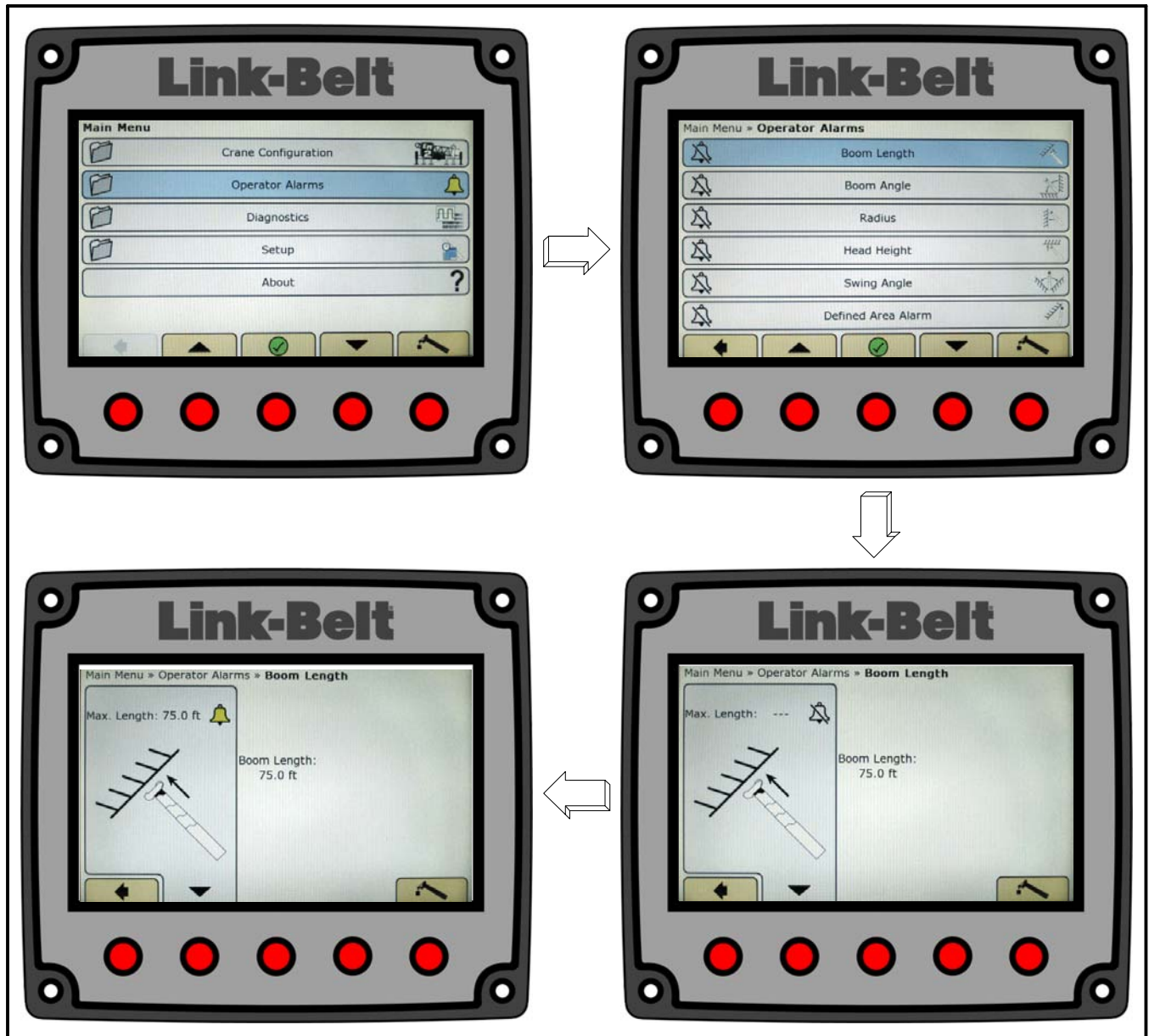


Figure 1—83
Boom Length Alarm

To Set Maximum Angle Alarm

Example: To have an alarm whenever the boom is above a 60 degree angle use the following procedure:








1. From the normal working screen, press the Main Menu button . Refer to Figure 1—81.
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1—82.
3. Scroll to Boom Angle , and press the OK/Enter button .
4. Position the boom to a 60 degree angle.
5. Press the corresponding button for “Max. Angle” to set the alarm. The displayed value will be the alarm setting. The will appear to indicate that the alarm is set.
6. Press the back button to return to the Operator Alarms menu or press the Working Screen button to return to the normal working screen.

Operator's Manual

7. Test the alarm, with no load, to ensure the alarm points have been properly set. When raising the boom and approaching 60 degree boom angle, the audio will sound intermittently and "Approaching Maximum Angle" will appear in the warning message area. The audible alarm will sound continuously whenever the boom is raised above 60 degrees and "Maximum Angle" will appear in warning message area.

To Set Maximum Length Alarm

Example: To have an alarm whenever the boom length exceeds 75 feet (22.9m), use the following procedure:

1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1–83.
3. Scroll to Boom Length , and press the OK/Enter button .
4. Extend the boom so that the length is 75 feet (22.9m).
5. Press the corresponding button for "Max. Length" to set the alarm. The displayed value will be the alarm setting. The  will appear to indicate that the alarm is set.
6. Press the back button  to return to the Operator Alarms menu or press the Working Screen button  to return to the normal working screen.
7. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching 75 foot (22.9m) boom length, the audio alarm will sound intermittently and "Approaching Maximum Length" will appear in the warning message area. The audible alarm will sound continuously whenever the boom length exceeds 75 feet (22.9m) and "Maximum Length" will appear in the warning message area.

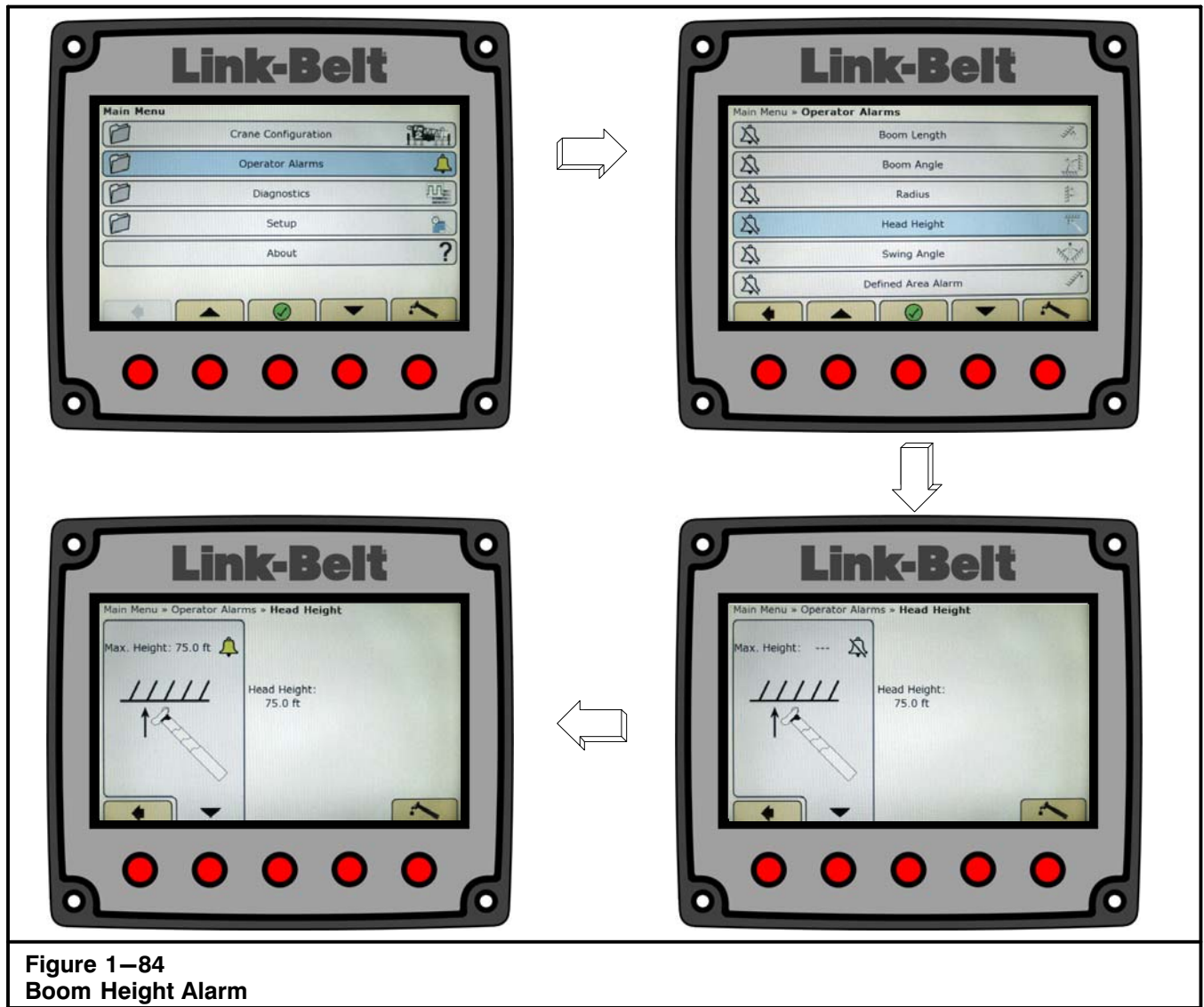


Figure 1–84
Boom Height Alarm

To Set Maximum Height Alarm

Note: The height measured here is from the carrier deck to the tip of the attachment.

Example: To have an alarm whenever the boom tip height exceeds 75 feet (22.9m), use the following procedure:

1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1–84.
3. Scroll to Head Height , and press the OK/Enter button .
4. Extend the boom and/or adjust the boom angle so that the head height is 75 feet (22.9m).
5. Press the corresponding button for “Max. Height” to set the alarm. The displayed value will be the alarm setting. The will appear to indicate that the alarm is set.
6. Press the back button to return to the Operator Alarms menu or press the Working Screen button to return to the normal working screen.
7. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching 75 foot (22.9m) boom tip height, the audio alarm will sound intermittently and “Approaching Maximum Height” will appear in the warning message area. The audible alarm will sound continuously whenever the boom tip height exceeds 75 feet (22.9m) and “Maximum Height” will appear in the warning message area.

Operator's Manual

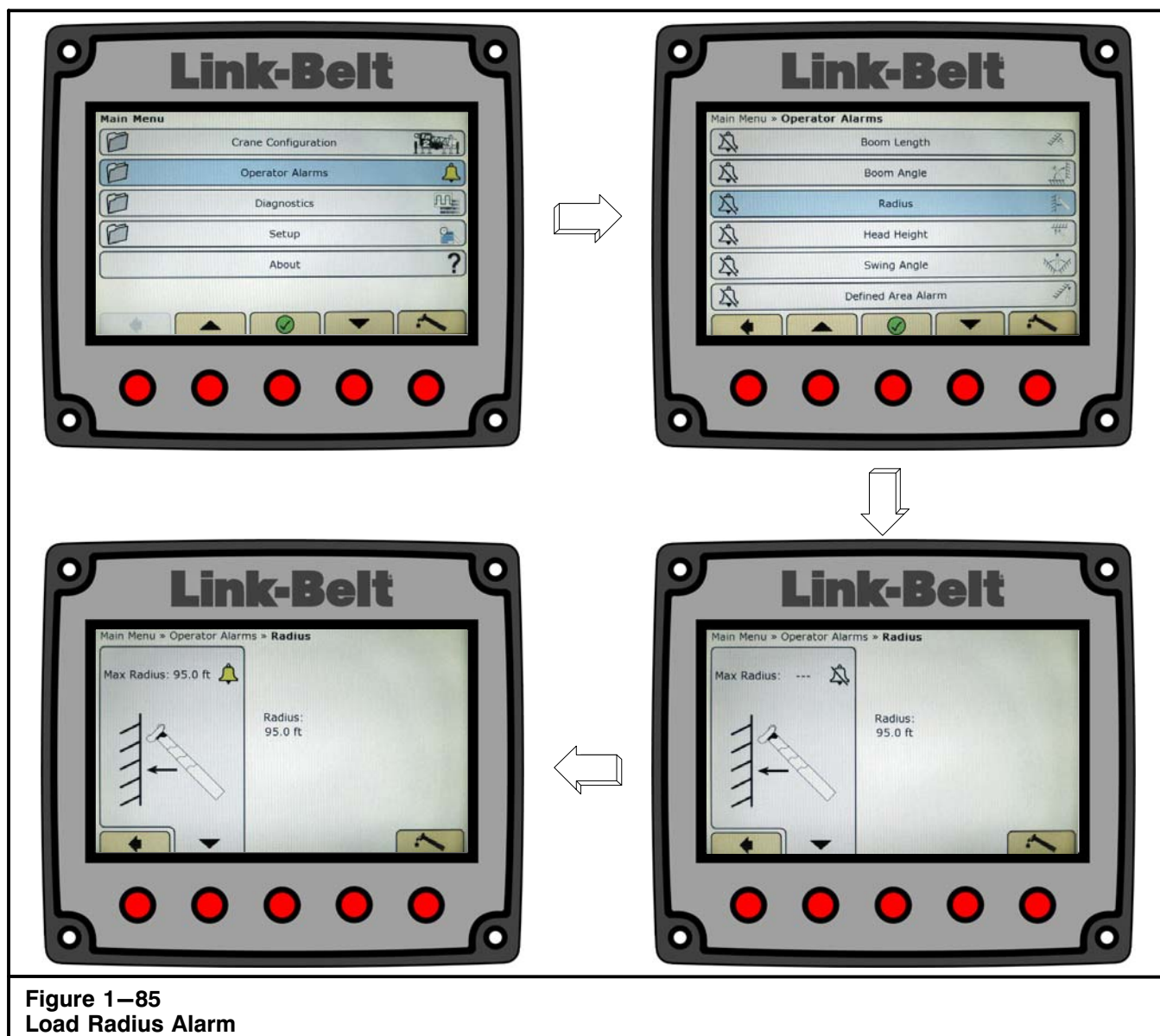









Figure 1-85
Load Radius Alarm

To Set Maximum Radius Alarm

Example: To have an alarm whenever the boom radius exceeds 95 feet (29.0m), use the following procedure:

1. From the normal working screen, press the Main Menu button . Refer to Figure 1-81.
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1-85.
3. Scroll to Radius , and press the OK/Enter button .
4. Extend the boom and/or adjust the boom angle so that the radius is 95 feet (29.0m).
5. Press the corresponding button for "Max. Radius" to set the alarm. The displayed value will be the alarm setting. The  will appear to indicate that the alarm is set.
6. Press the back button  to return to the Operator Alarms menu or press the Working Screen button  to return to the normal working screen.
7. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching 95 foot (29.0m) boom radius, the audio will sound intermittently and "Approaching Maximum Radius" will appear in the warning message area. The audible alarm will sound continuously whenever the boom radius exceeds 95 feet (29.0m) and "Maximum Radius" will appear in warning message area.

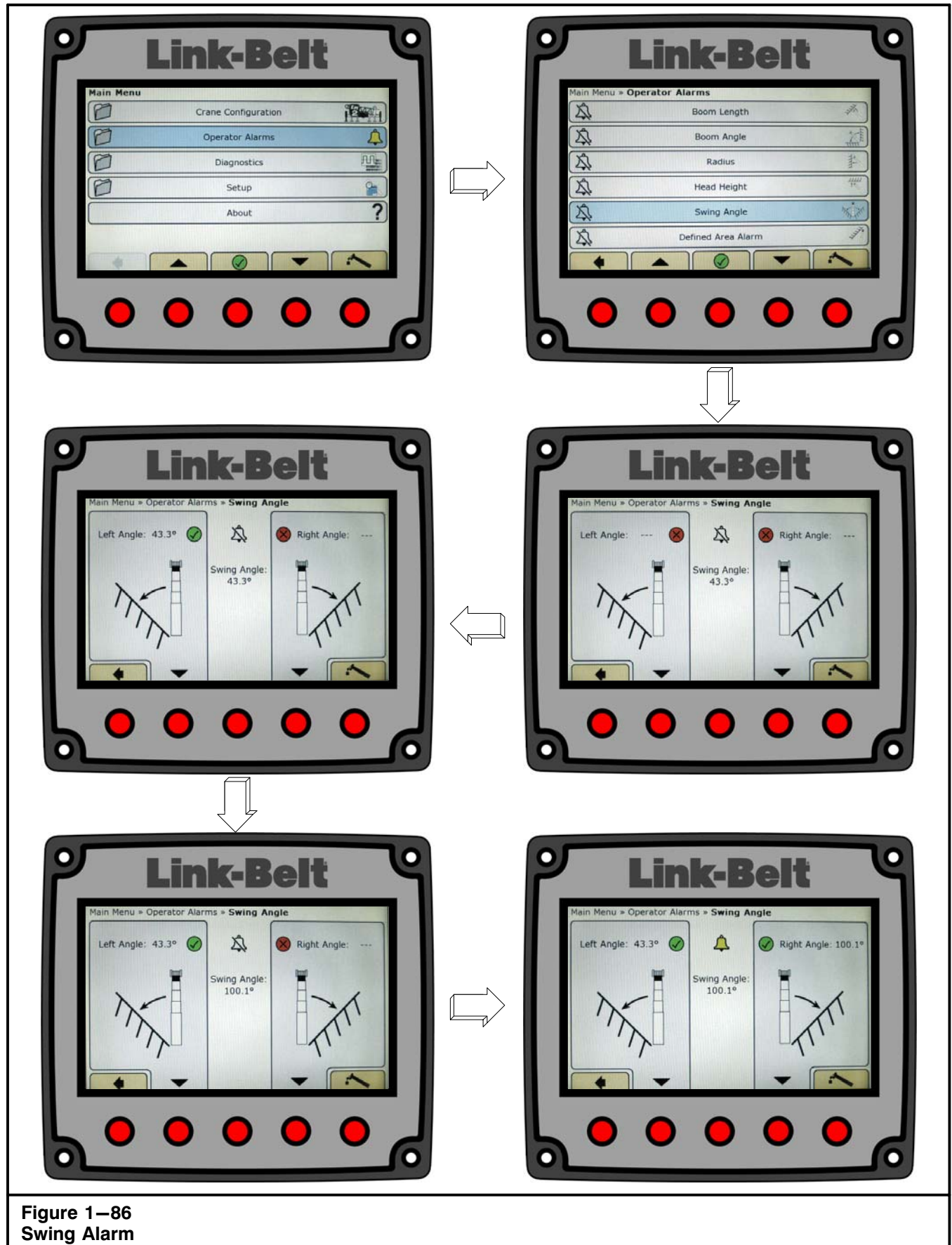











Figure 1–86
Swing Alarm

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To Set Left And Right Swing Alarms

Example: To have an alarm whenever the LEFT SWING AND RIGHT SWING exceed pre-determined alarm points, use the following procedure:

1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1–86.
3. Scroll to Swing Angle , and press the OK/Enter button .
4. Swing the boom to the left alarm point.
5. Press the corresponding button for “Left Angle” to enter the left alarm point. The displayed value will be the left alarm setting. The  will appear to indicate that the angle is set.
6. Swing the boom to the right alarm point.
7. Press the corresponding button for “Right Angle” to enter the right alarm point. The displayed value will be the right alarm setting. The  will appear to indicate that the angle is set.
8. When both angles are set, the  will appear to indicate that the alarm is set.
9. Press the back button  to return to the Operator Alarms menu or press the Working Screen button  to return to the normal working screen.
10. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching the set alarm point, the audio alarm will sound intermittently and “Approaching Swing Angle Limit” will appear in the warning message area. The audible alarm will sound continuously whenever the swing exceeds the alarm points and “Swing Angle Limit” will appear in warning message area.

Note: Both the left and right swing alarms must be set for the system to determine the operator set working area.

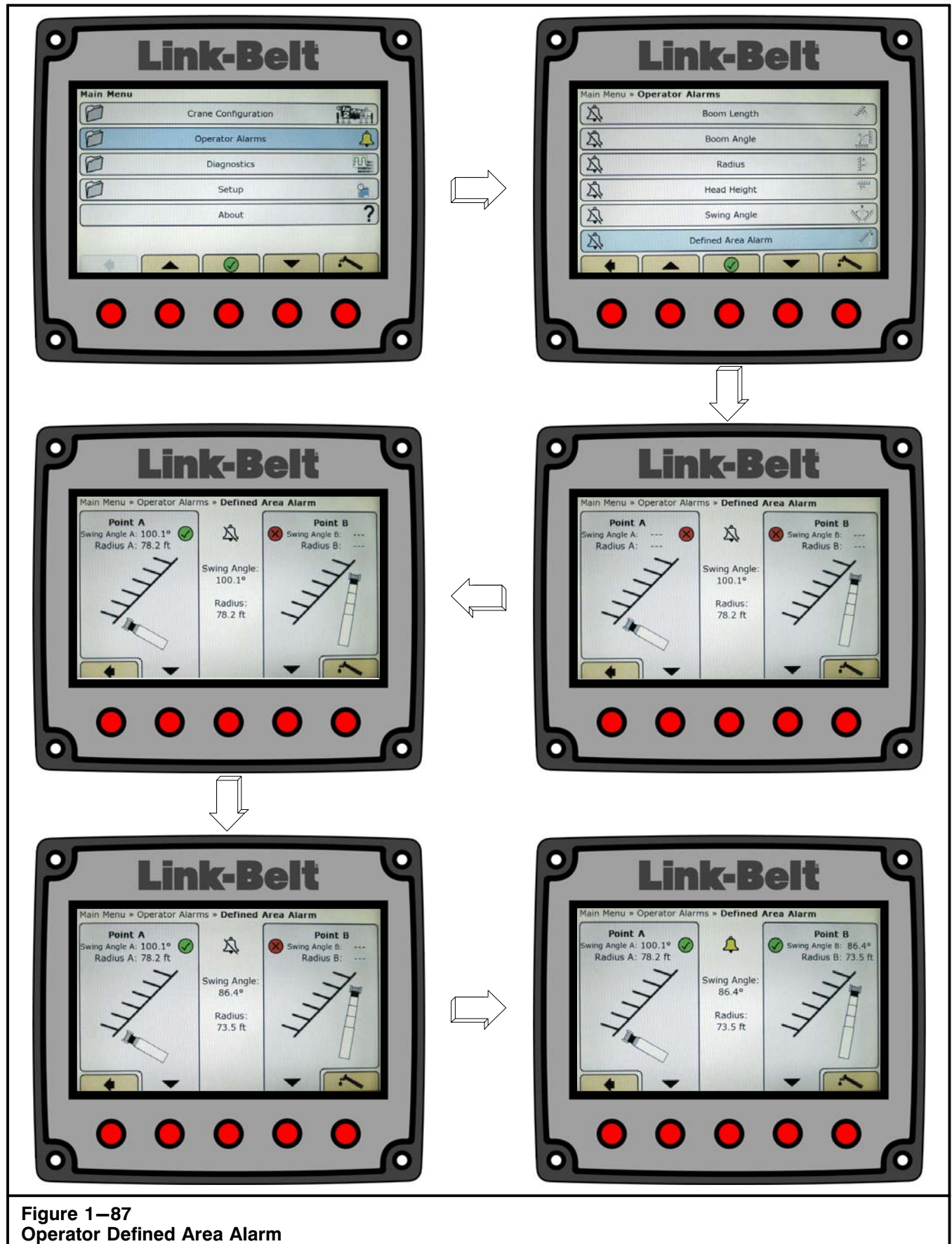


Figure 1—87
Operator Defined Area Alarm

Operator's Manual

Operator Defined Area Alarm

The operator defined area alarm, when set, will define an imaginary vertical plane between two set points to optimize the working area. When approaching the plane, the audio alarm will sound intermittently, and the message "Approaching Defined Area" will appear in the warning message area. When passing the plane, the audio alarm will sound continuously and the message "Defined Area" will appear on the warning message area. Use the following procedure, Figure 1–87, and Figure 1–88 to set the operator defined area alarm.



WARNING

The operator defined area alarm is a warning device. All functions remain operational when entering the operator defined bad area. For safe operation, adequate distance must be maintained to allow for operator reaction time to avoid entering the bad area. It is the responsibility of the operator to set points which ensure that the crane's boom, attachment, load, rigging, etc. maintains a safe working distance and complies with local safety regulations.

Setting Operator Defined Area Alarm

1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.
2. Scroll to Operator Alarms, and press the OK/Enter button . Refer to Figure 1–87.
3. Disable any previously set left and right swing alarms if required. Refer to "To Disable Operator Settable Alarms" in this Section of this Operator's Manual.

Note: It is recommended to clear the left and right swing alarms prior to setting the defined area alarm.

4. Scroll to Defined Area Alarm , and press the OK/Enter button .



WARNING

Avoid positioning the boom, attachment, load, rigging, etc. into the bad area when setting the left or right alarm points.

When selecting the left and right alarm points, ensure that the load will maintain a safe distance from the obstacle. Also ensure that the two points are set so that the tailswing of the crane will not enter the bad area.

5. Position the boom, attachment, load, rigging, etc. to the desired Point A and press the corresponding button for "Point A" to set the first point. The displayed values for swing angle and radius will be the set point. The will appear to indicate that Point A is set.

Note: For best results, the two points should be separated by a minimum of 10 ft (3m) or 30 degrees.

6. When both points are set, the will appear to indicate that the alarm is set.
7. Position the boom, attachment, load, rigging, etc. to the desired Point B and press the corresponding button for "Point B" to set the second point. The displayed values for swing angle and radius will be the set point. The will appear to indicate that Point B is set.
8. When both angles are set, press the back button to return to the Operator Alarms menu or press the Working Screen button to return to the normal working screen.
9. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching the plane, the audio alarm will sound intermittently and the message "Bad Working Area" will appear on the warning message area. When passing the plane, the audio alarm will sound continuously and the message "Bad Working Area" will appear on the warning message area.



WARNING

If crane or obstacle is moved or if a different size load is lifted, the area alarm must be reset.

To Disable Operator Settable Alarms

1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.
2. Scroll to Operator Alarms, and press the OK/Enter button .
3. Scroll to the desired alarm to be disabled, and press the OK/Enter button .
4. Press the corresponding button for each alarm. The icon indicates the alarm has been cleared.
5. When all desired alarms are disabled, press the back button to return to the Operator Alarms menu or press the Working Screen button to return to the normal working screen.

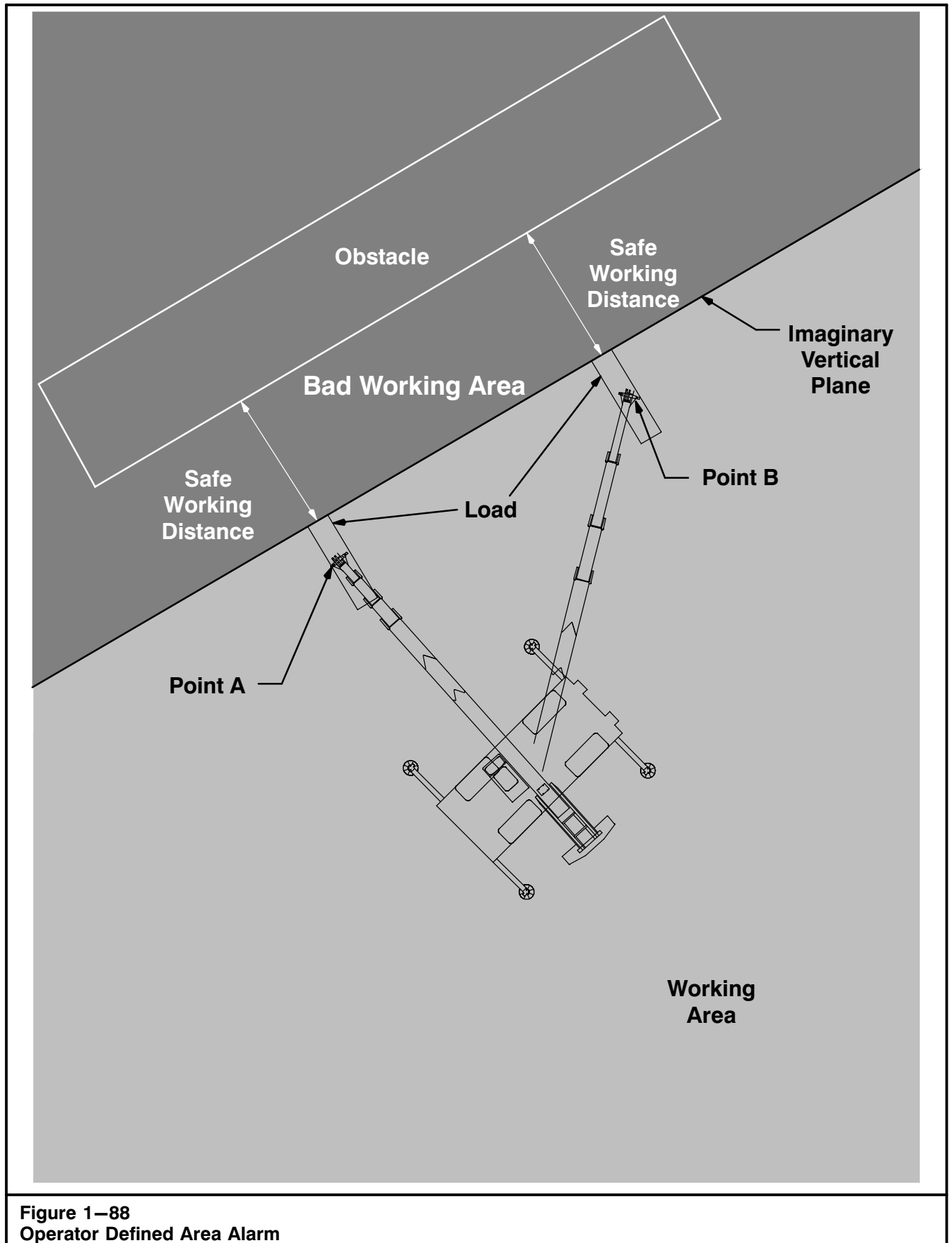
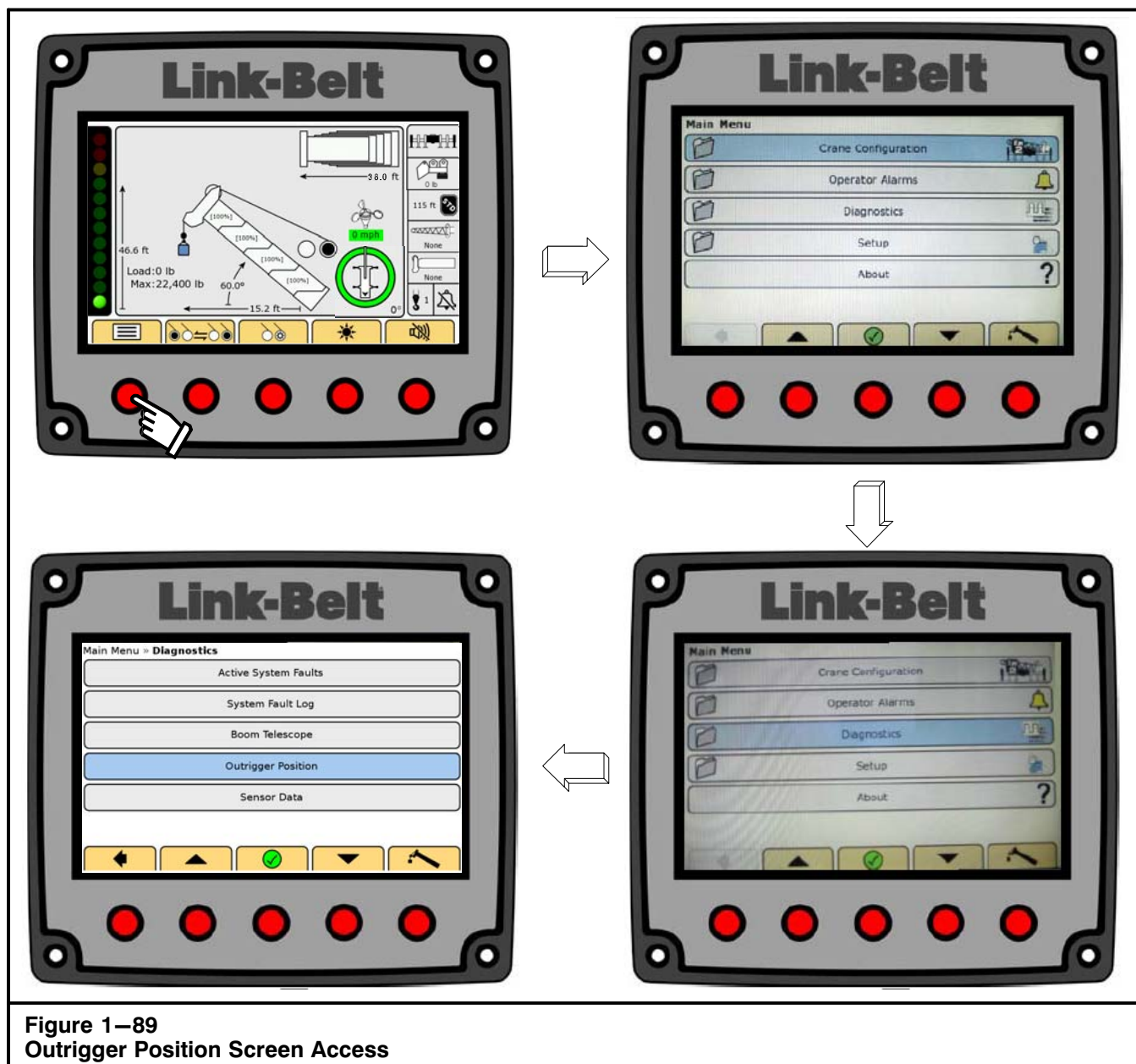





Figure 1–88
Operator Defined Area Alarm

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Outrigger Position Screen

The calibrated position of each outrigger beam will be graphically displayed on the screen. Also the outrigger beam length will be displayed from the centerline of the crane. Refer to Figure 1-89 and Figure 1-90.

1. From the normal working screen, press the Main Menu button .
2. Scroll to Diagnostics, and press the OK/Enter button .
3. Scroll to Outrigger Position and press the OK/Enter button .



WARNING

The outrigger position screen is used to display outrigger beam position. Properly extend the outrigger beams using the outrigger extend position lever to ensure correct outrigger beam position. Failure to do so may cause a loss of stability and possible serious personal injury and/or major crane damage.

!!THIS SCREEN IS AN OPERATOR'S AID – NOT A SAFETY DEVICE!!

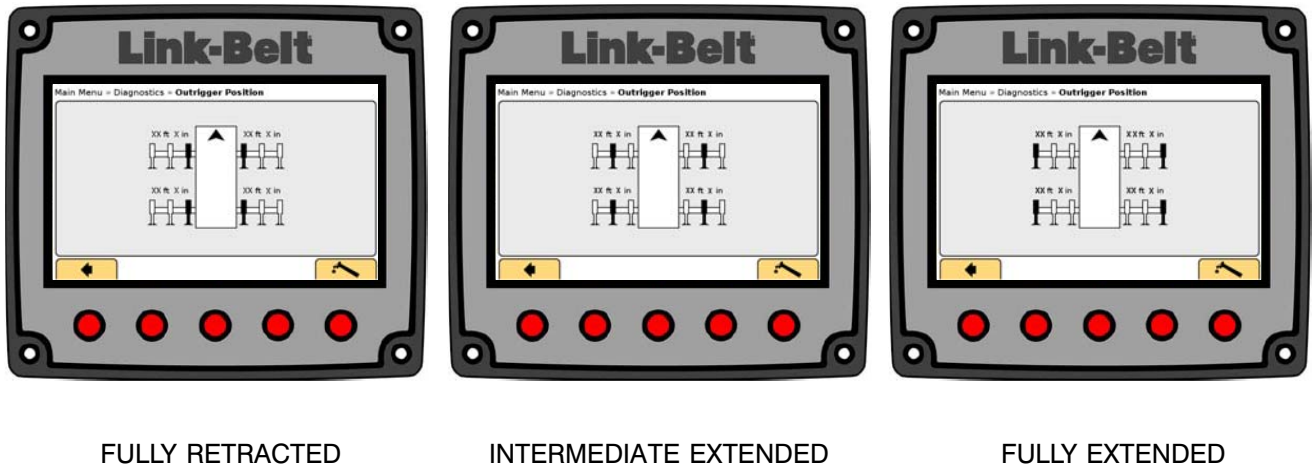

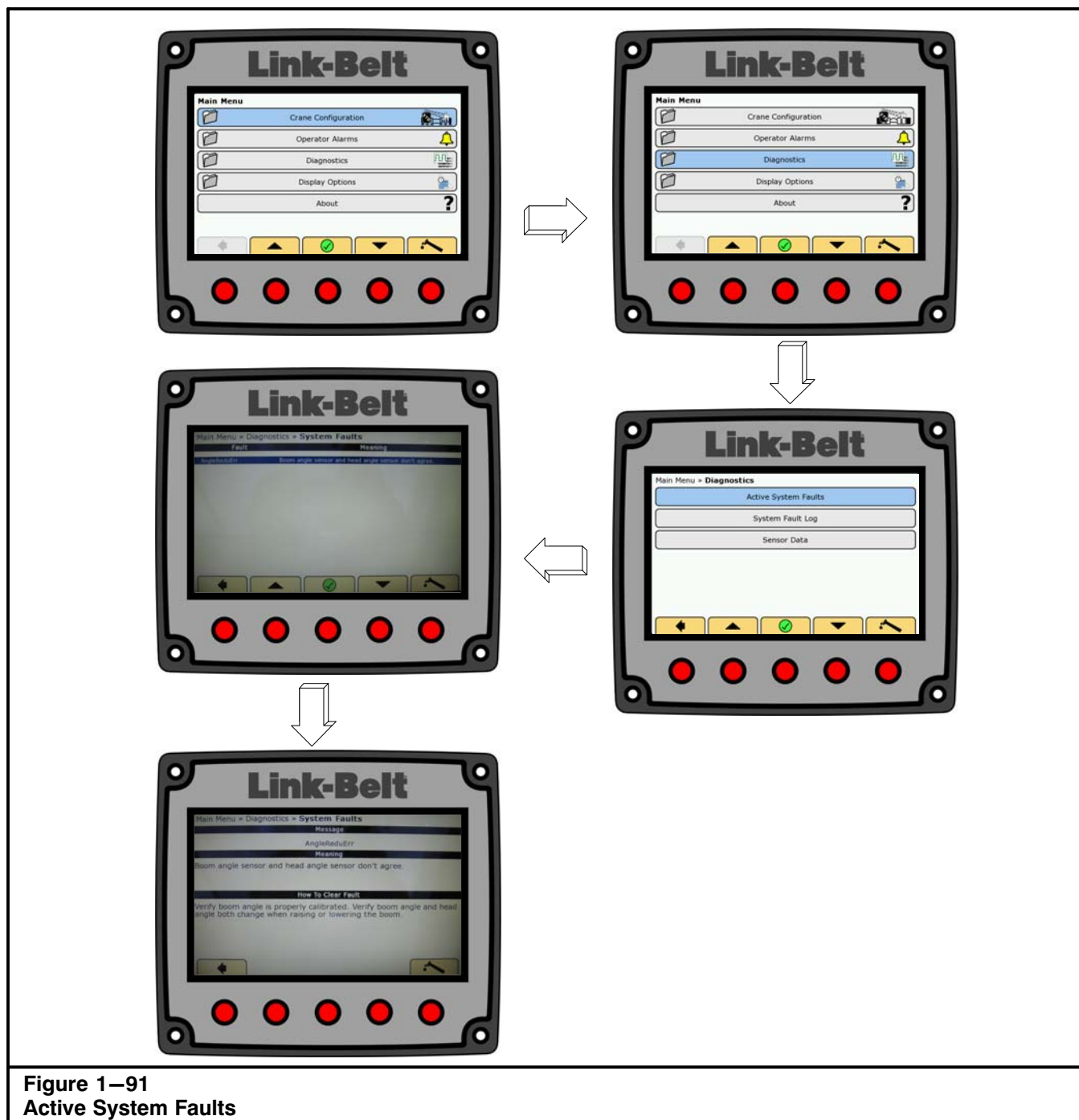


Figure 1—90
Outrigger Position Screen

4. Outrigger position and length of each beam, from crane centerline to pontoon centerline, will be displayed.
5. Press the Working Screen Button  to return to the normal working screen.

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Active System Faults

The Active System Faults menu displays current system faults. Refer to Figure 1-91 and the Active System Faults Messages chart.

1. From the normal working screen, press the Main Menu button . Refer to Figure 1-81.
2. Scroll to Diagnostics, and press the OK/Enter button . Refer to Figure 1-91.
3. Scroll to Active System Faults, and press the OK/Enter button .

4. Scroll to the fault code to be addressed, and press the OK/Enter button .
5. The message selected, meaning of the message, and how to clear the message will be displayed.
6. Press the back button to return to the System Faults menu or press the Working Screen button to return to the normal working screen.

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Active System Faults Messages		
Message	Meaning	How To Clear Message
DispComErr	Display communication lost.	Verify display is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
ATBComErr	ATB switch communication lost.	Verify boom reel is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
ATBShort	ATB switch short circuit.	Verify ATB switch is functioning properly. Check wiring between ATB switch and boom reel.
LenComErr	Boom length sensor communication lost.	Verify boom reel is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
LenDataErr	Boom length sensor data is invalid.	Verify boom length is properly calibrated. Verify boom length value changes when extending or retracting the boom.
LenReduErr	Boom length sensor and boom controller length don't agree.	Verify boom length and boom controller are properly calibrated. Verify sensor boom length and boom controller length both change when extending or retracting the boom.
AngleComErr	Boom angle sensor communication lost.	Verify boom reel is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
AngleDataErr	Boom angle sensor data is invalid.	Verify boom angle is properly calibrated. Verify boom angle value changes when raising or lowering the boom.
AngleReduErr	Boom angle sensor and head angle sensor don't agree.	Verify boom angle is properly calibrated. Verify boom angle and head angle both change when raising or lowering the boom.
HeadComErr	Head angle sensor communication lost.	Verify boom reel is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
HeadDataErr	Head angle sensor data is invalid.	Verify head angle is properly calibrated. Check wiring between head angle sensor and boom reel. Verify head angle changes when raising or lowering the boom.
HPresComErr	Head pressure sensor communication lost.	Verify head pressure sensor is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
RPresComErr	Rod pressure sensor communication lost.	Verify rod pressure sensor is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
DispIOComErr	Display I/O communication lost.	Verify display is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.
BoomComErr	Boom controller communication lost.	Verify boom controller is properly connected to the CAN bus. Check all CAN bus wiring including termination resistors.






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Figure 1-92
Sensor Data Screen

Sensor Data

The Sensor Data menu displays data being read by various sensors on the crane. Refer to Figure 1-92.

1. From the normal working screen, press the Main Menu button . Refer to Figure 1-81.
2. Scroll to Diagnostics, and press the OK/Enter button .
3. Scroll to Sensor Data, and press the OK/Enter button . Refer to Figure 1-92.
4. The data being generated by the various sensors will be displayed.
5. Press the back button  to return to the Diagnostics menu or press the Working Screen button  to return to the normal working screen.

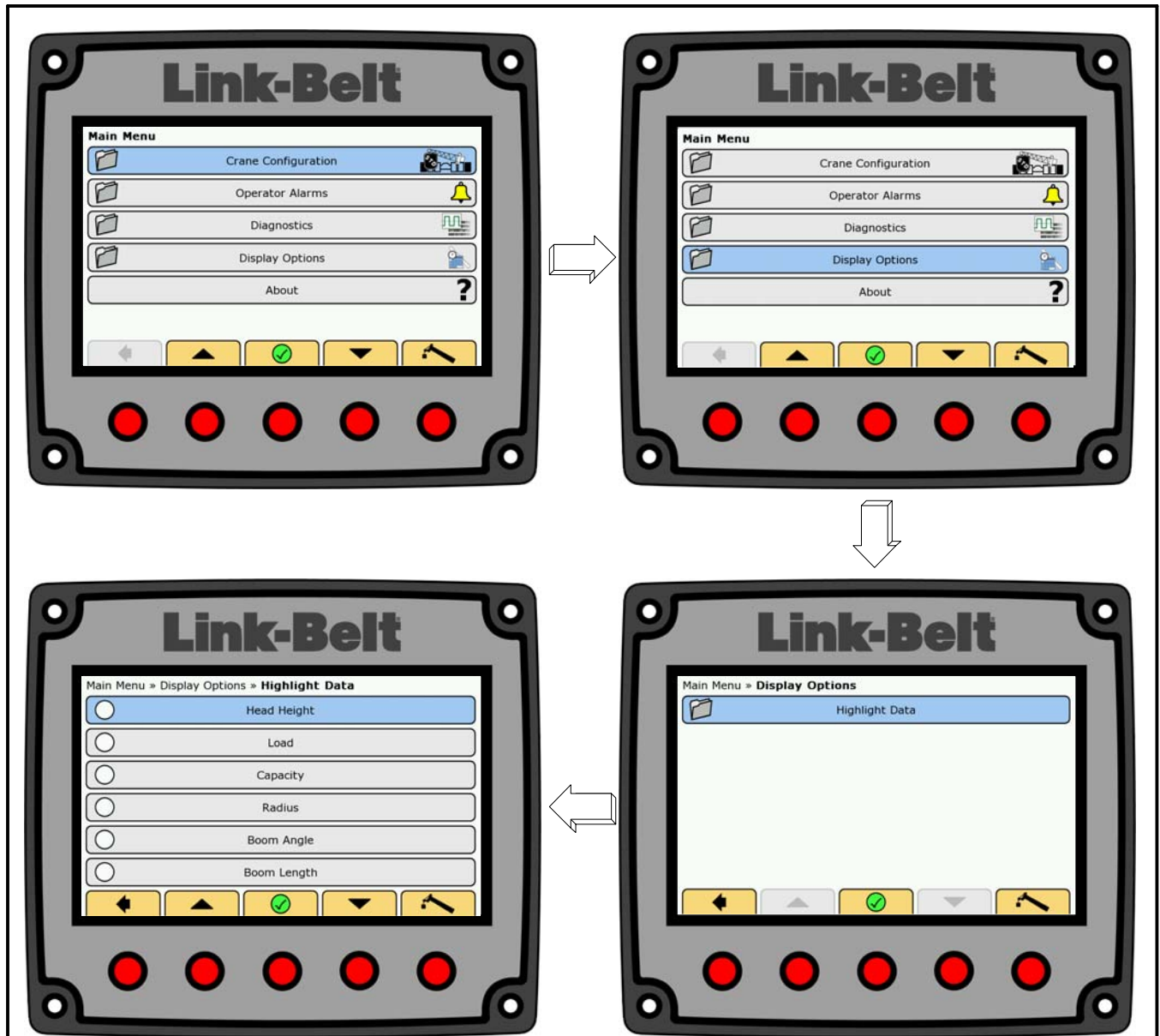









Figure 1–93
Highlight Data

Highlight Data Menu

The Highlight Data menu allows the Operator to select specific data to be highlighted on the normal working screen. The data will appear with a purple highlighting. Refer to Figure 1–93.

1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.
2. Scroll to Crane Configuration, and press the OK/Enter button . Refer to Figure 1–93.

3. Scroll to Display Options, and press the OK/Enter button .
4. Scroll to Highlight, and press the OK/Enter button .
5. Scroll to the information to be highlighted, and press the OK/Enter button .
6. Repeat Step 5 for each item to be highlighted.
7. Press the back button  to return to the Display Options menu or press the Working Screen button  to return to the normal working screen.

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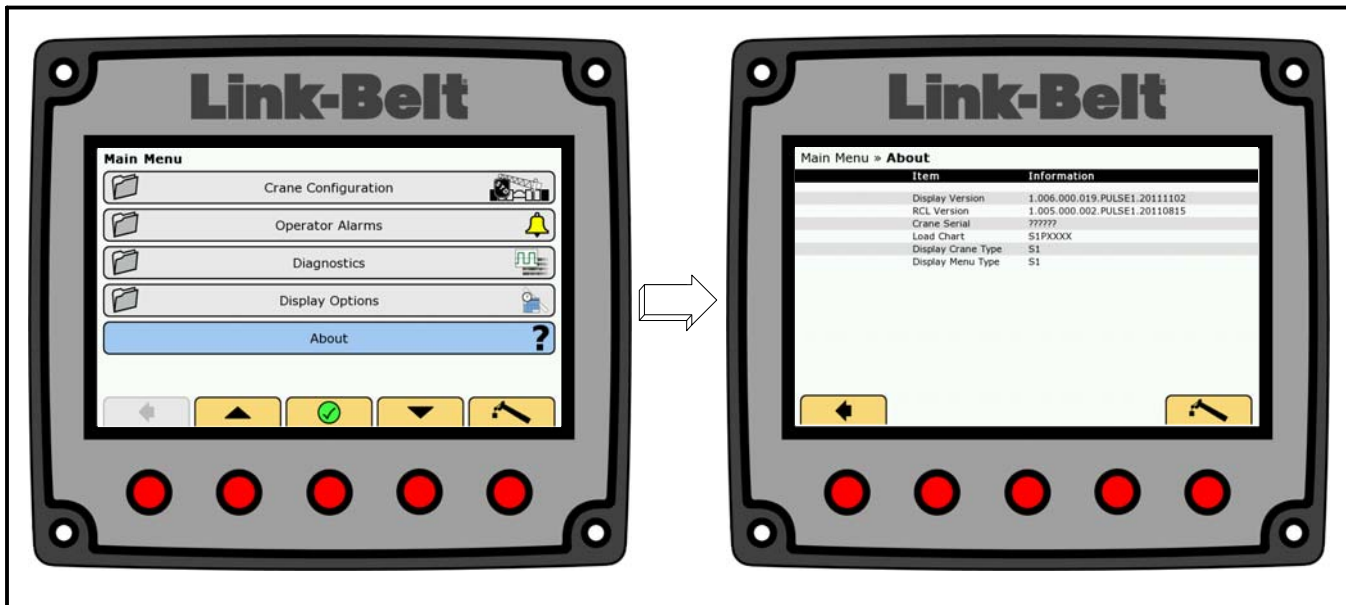






Figure 1–94
About Screen

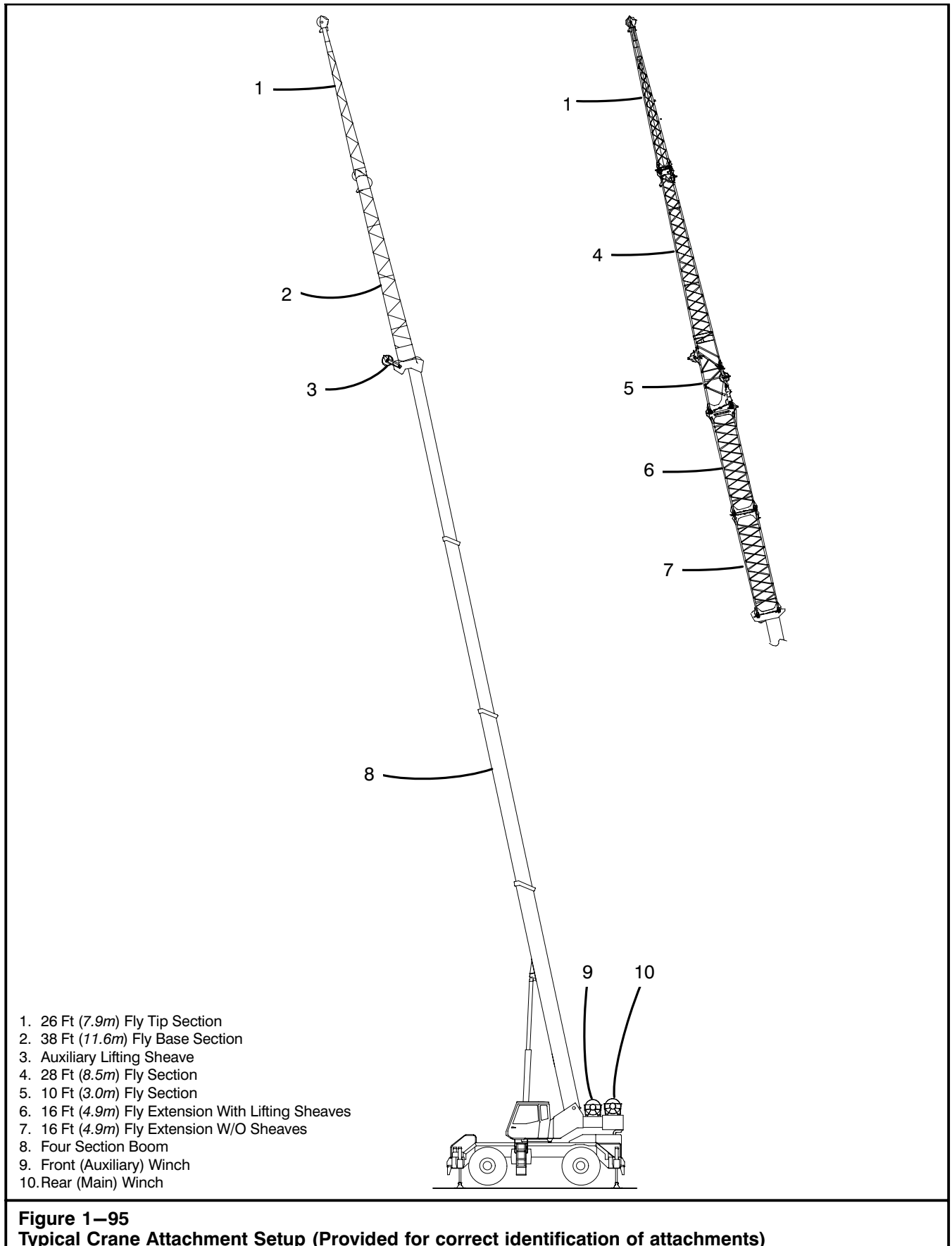
About Menu

The About menu displays which version of the Display, ECM, and Boom Controller software is currently installed. Refer to Figure 1–94. The crane serial number is also displayed on this screen.

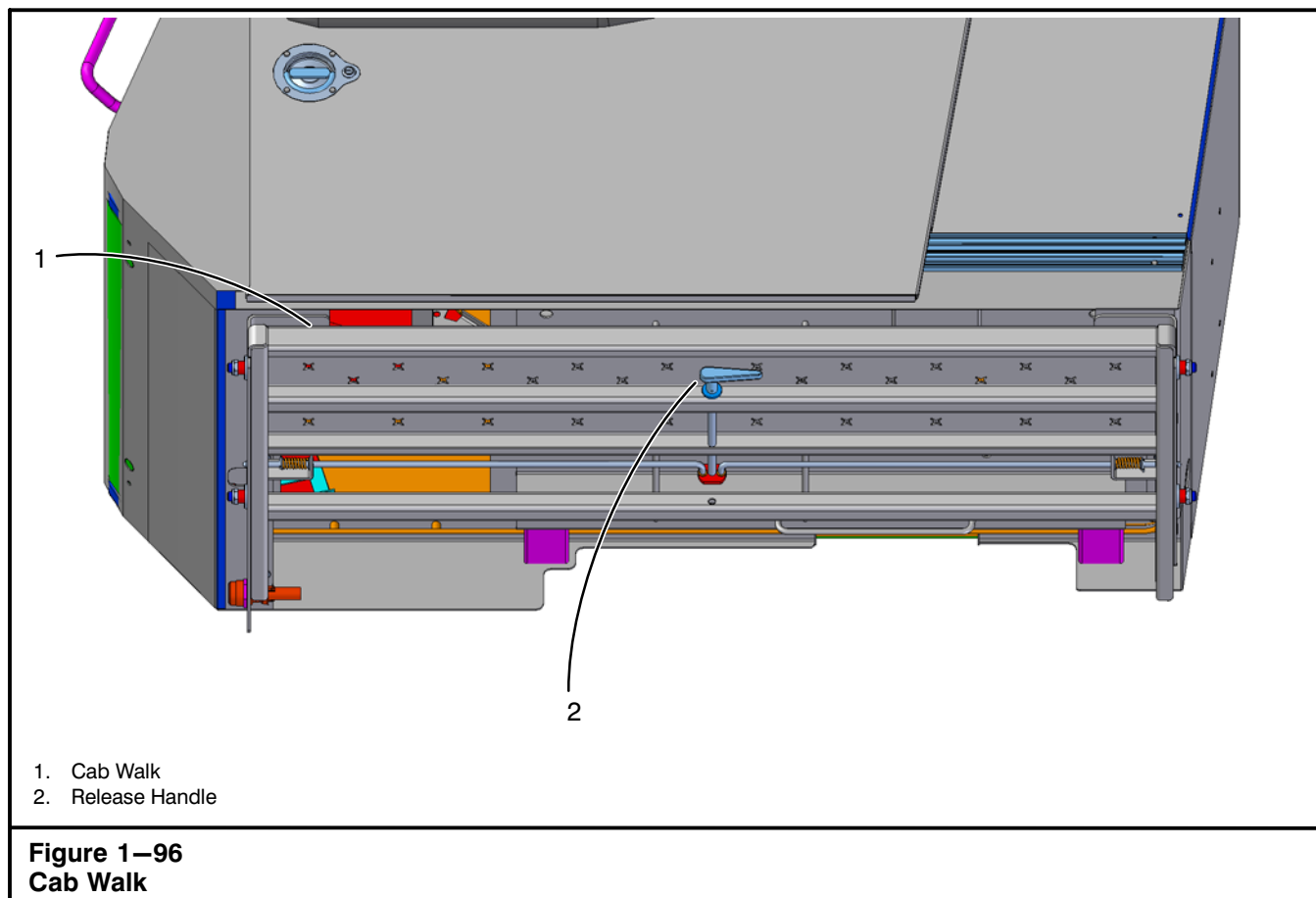
1. From the normal working screen, press the Main Menu button . Refer to Figure 1–81.

2. Scroll to About, and press the OK/Enter button .
3. Press the back button  to return to the Main menu or press the Working Screen button  to return to the normal working screen.

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Entering And Exiting The Operator's Cab

Entering or exiting the operator's cab could be hazardous if certain aspects are not taken into consideration. The elevation of the carrier deck and operator's cab alone could cause serious injury if someone was to fall. For this reason ladders are mounted on each side of the carrier to provide easy access to the carrier deck and the operator's cab. A cab walk assembly is mounted under the operator's cab and should be extended when entering/exiting the operator's cab. Refer to Figure 1—96. Turn the release handle to extend/retract the cab walk assembly. (Retract the cab walk anytime the crane is

traveled, lifted, or transported.) Numerous hand grips are also attached to the operator's cab as well as non-skid safety strips on the surface of the carrier deck, to provide safe entry to the operator's cab. Use these features to make climbing on the crane as safe as possible. Remain in three point contact with the crane at all times (two hands and one foot or two feet and one hand).

Inside the operator's cab, two separate features are provided to prevent accidental operation of the hydraulic controls while entering or exiting the operator's seat. Refer to "Function Lockout Switch" and "Movable Left Side Console" in this Section of this Operator's Manual for complete operating instructions.

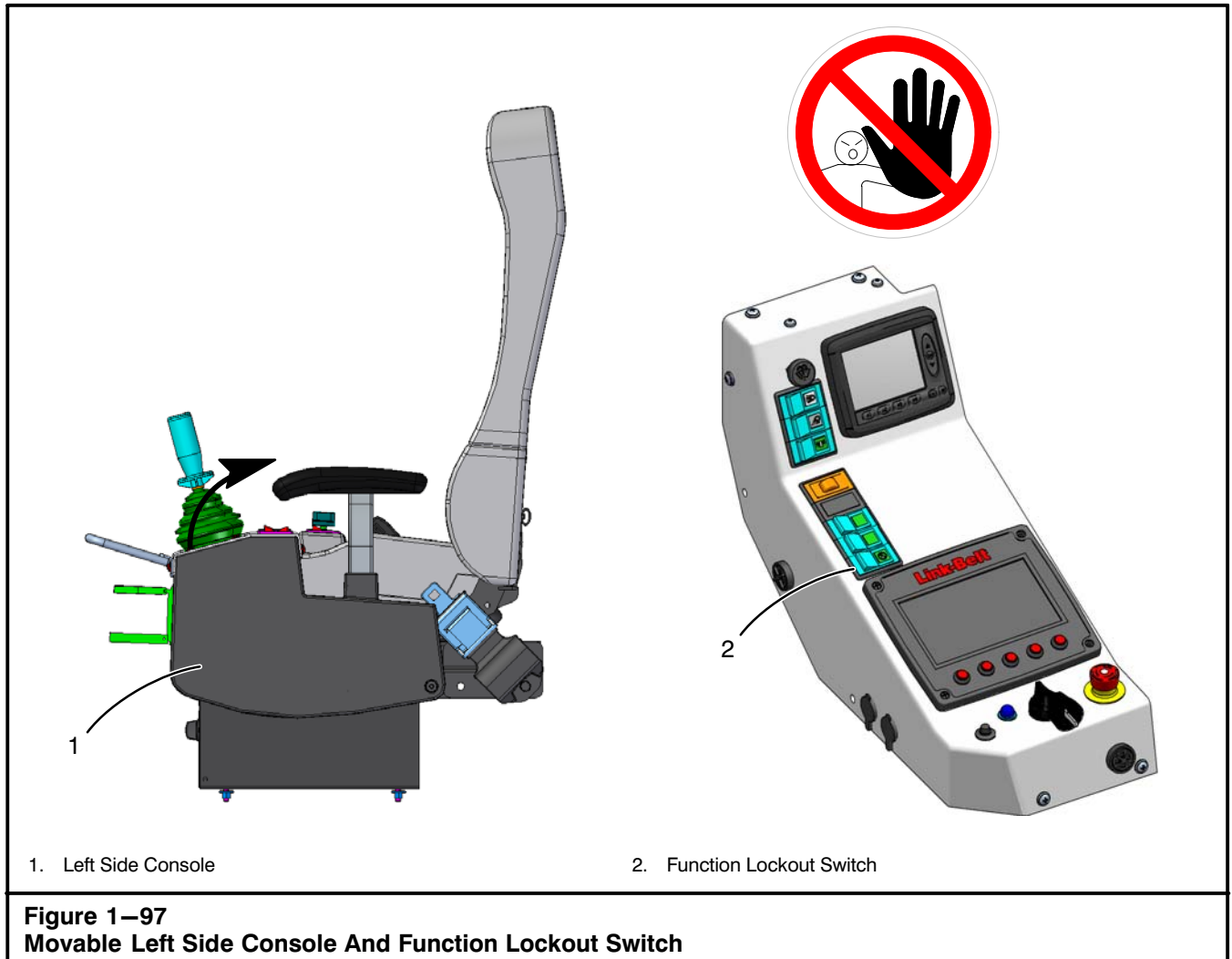


Figure 1-97
Movable Left Side Console And Function Lockout Switch

Function Lockout Switch

This switch is used to disable the hydraulic functions which are operated by the control levers and boom telescope foot pedal. The switch is on the right side control console. Refer to Figure 1-97. Press the left part of the switch to disable hydraulic functions and to prevent inadvertent operation of these controls. To allow normal operation of the control levers and boom telescope foot pedal, press the right part of the function lockout switch. The right part of the switch will illuminate to indicate the switch is in the "OPERATION" position. This switch must always be in the "DISABLE" position before entering or exiting the operator's seat.

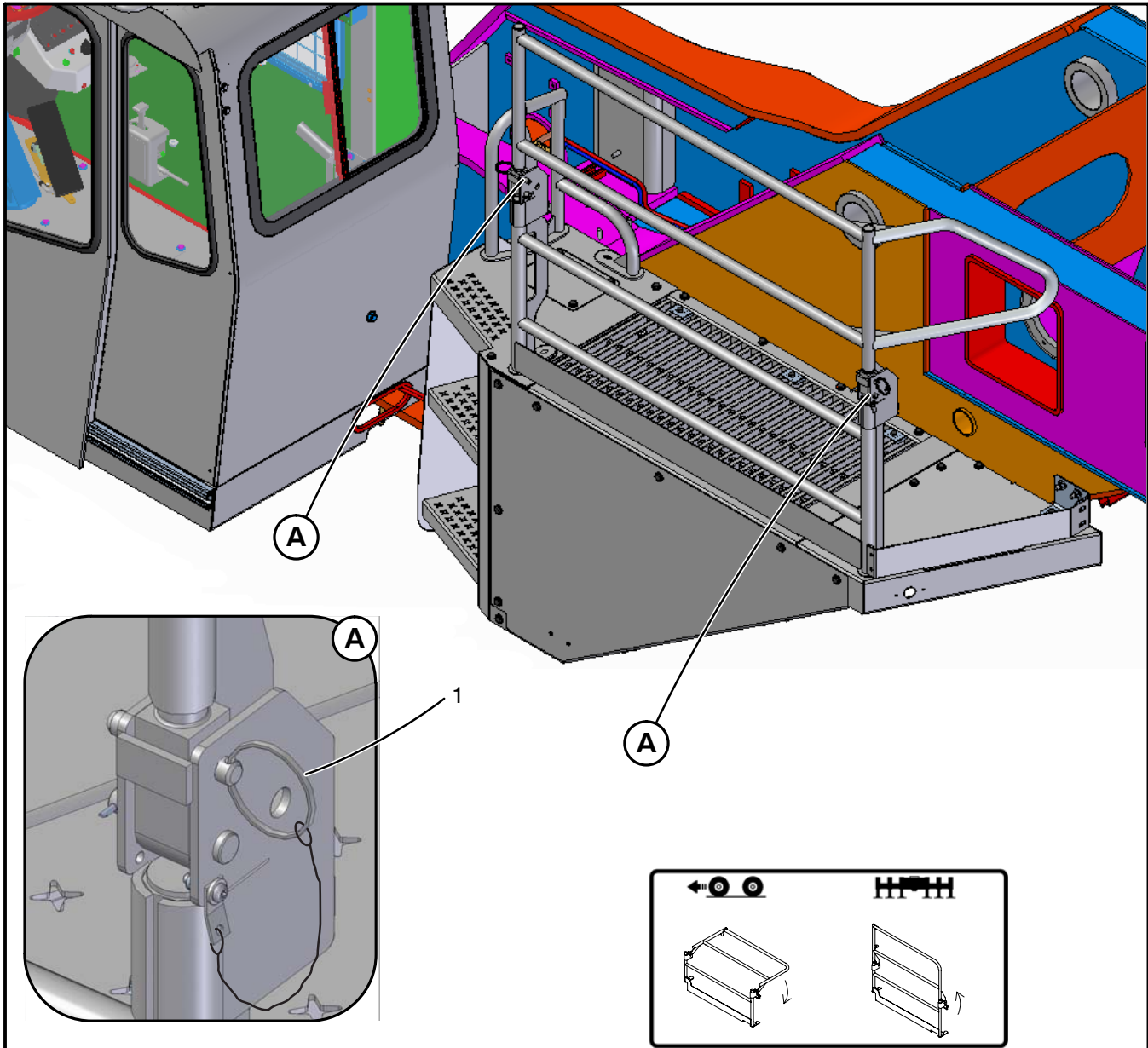
Movable Left Side Console

The left side console is hinged at the rear to allow the operator to lift the console up, out of the way while entering or exiting the operator's cab. A spring assists lifting the console.

Lifting the left side console also performs the same duty as the function lockout switch, disabling all hydraulic functions related to the control levers and boom telescope foot pedal. Lifting the left side console also automatically applies the swing park brake. Ensure the left side console is lifted up, out of the way before attempting to enter or exit the operator's cab.

One more feature which is available to ease entry and exit of the operator's cab, is the adjustable operator's seat. Lift the left hand arm rest up out of the way and move the seat and/or console back as required to allow safe entry. This feature also provides operator comfort during crane operation as well. Refer to "Operator's Seat" in this Section of the Operator's Manual for complete seat operating instructions.

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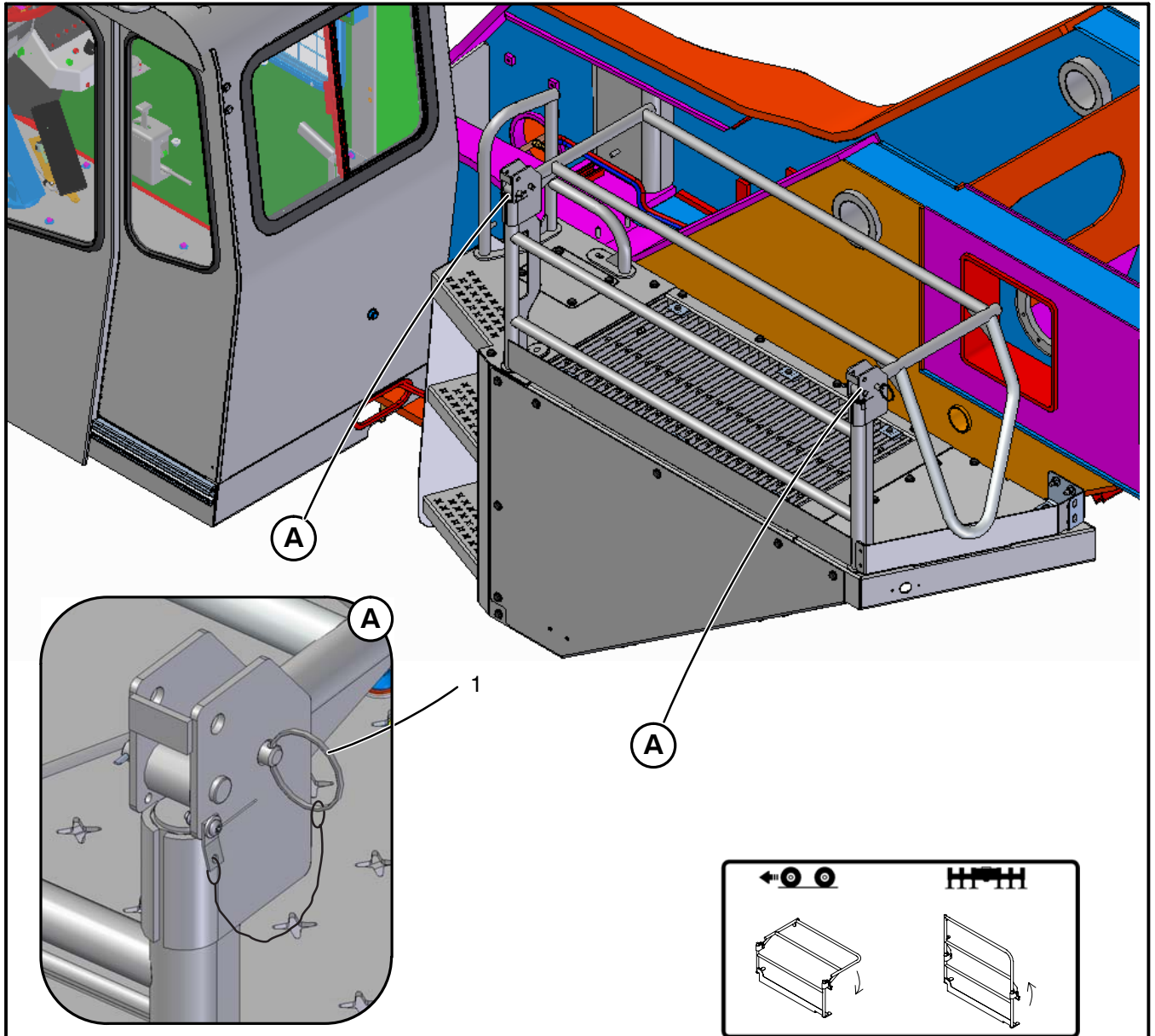
1. Quick Release Pin

Figure 1—98
Upper Guard Rails — Working Position

Upper Guard Rails

The crane is equipped with guard rails on the upper to make access to the upper safer when servicing the crane. The rails should remain in the Working position

at all times except during highway travel and when lifting or transporting the crane. Refer to Figure 1—98. Position the rails in the Stored/Travel position before traveling the crane on the highway and when transporting the crane. Refer to Figure 1—99.



1. Quick Release Pin

Figure 1–99
Upper Guard Rails – Stored/Travel Position

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Break-In Period

Operate a new crane at half throttle for the first twenty (20) hours of operation. A break-in period under moderate loads will assist in providing long, troublefree performance.

Before Starting Operations

Before starting daily operations, make the following checks and inspections:

Engine

Check fuel, oil, and cooling systems for proper fluid levels. Check for leaks. Repair or fill as required. Refer to engine manufacturer's manual for additional details.

Gear Cases

Visually inspect all gear cases for leaks or damage. If leaks or damage exist, repair and fill case to proper lubrication level.

Hydraulic System

Check all hoses for chafing, bulging, or other damage. Replace as necessary. Inspect hydraulic system for external leaks. Repair as needed. Check hydraulic reservoir oil level. Add oil if necessary.

Lubrication

Lubricate the crane as outlined in Section 2 of this Operator's Manual.

Note: Operators may have nothing to do with lubrication or maintenance of the crane, but it could be advantageous for them to be familiar with it. Knowledge of preventive maintenance makes the operator more aware of malfunctions in the crane so repairs can be made with a minimum of downtime.

Tires And Rims

Check tire inflation. Inflate to pressures per the Tire Inflation Label on the hydraulic reservoir or the Tire Inflation Chart in the Crane Rating Manual. Check wheel lug nut torque, each day, for the first five (5) days of operation and every 100 hours of operation thereafter. Refer to Section 3 of this Operator's Manual for additional information on tires and rims.

Wire Rope And Sheaves

Inspect all wire rope and sheaves for damage or deterioration. Replace as necessary. Refer to Section 3 and Section 5 of this Operator's Manual for additional information on wire rope.

General Inspection

Visually inspect the entire crane for loose or missing cotter pins or bolts, or damaged fly chords or lattices. Check for oil or fluid leaks. Make repairs as needed.

Electrical System

Check the operation of all lights, windshield wipers, horns, turn signals, etc. Repair as needed.

Brakes

Start the engine and check travel park brake and service brake operations. Adjust or repair as needed.

Controls

Check all controls for proper operation and adjustment. Repair as needed.

Fire Extinguisher

A fire extinguisher is mounted in the operator's cab under the left console. Refer to Figure 1—58. It is an A B C type fire extinguisher, meaning it is capable of extinguishing most types of fires. The operator should be familiar with its location, the clamp mechanism used to secure it in place, and foremost the operation of the device. Specific instructions, regarding operation, are given on the label attached on the fire extinguisher. A charge indicator on the fire extinguisher monitors the pressure within the tank. Check the indicator daily to ensure the fire extinguisher is adequately charged and ready for use.

Carrier Suspension

Check that the oscillation suspension is properly adjusted and functioning normally. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual. During pick and carry operations and/or when traveling the crane, damage to the axles, cylinders, and other suspension components can occur if the oscillation suspension is not properly adjusted. Oscillation cylinders which are not properly adjusted can leave suspension components unprotected from shock loads which can lead to major crane damage.

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Boom Distortion Due To Thermal Effects Of The Sun

The heat from the sun may have a thermal effect on the sides of telescopic booms causing the sides of the boom to expand (lengthen). The sides of the boom may not expand equally if the boom is extended for long periods of time with only one side of the boom exposed to the sun. The unequal expansion may cause boom distortion (the boom may “deflect” to one side). This is more noticeable with long boom lengths and/or long booms with long lattice flies attached to the boom.

For example, a 100 ft (30.5m) main boom, with a 50°F (10°C) temperature differential between the two sides of the boom, may cause the centerline of the main boom head to “deflect” as much as 3 ft (0.9m) off the centerline of the crane. Attaching a 50 ft (15.2m) lattice fly to the same boom may cause the centerline of the fly head to “deflect” as much as 10 ft (3.0m) off the centerline of the crane. This “deflection” to one side creates a “side load” on the boom and/or fly. Side load on a boom or fly, whether induced by the load or thermal effects, is dangerous and shall be avoided.

Prior to lifting any loads, inspect the boom or boom and fly combination to ensure they are straight. If the boom or boom and fly combination is not straight, ensure that all the boom wear pads are properly adjusted.

If the boom is distorted due to temperature differential on the sides of the boom, reposition the boom to allow the thermal effects from the sun to equalize the temperatures of the side walls of the boom to eliminate the distortion before lifting a load.

Engine Starting Procedure

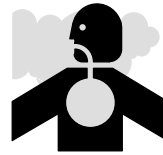


WARNING

This Operator's Manual and the engine manufacturer's manual must be thoroughly read and understood by the operator before starting the engine. Serious personal injury and/or major crane damage could result from improper operating procedures.

Before attempting to start the engine, the operator should carefully read and understand the engine starting instructions in the engine manufacturer's manual and this Operator's Manual. Attempting to start or run the engine before studying these instructions may result in engine damage. The operator should learn and obey all applicable “Rules of the Road” and if not already a competent driver, obtain instructions to attain these necessary skills. With the crane fully serviced and the operator familiar with all gauges, switches, controls, and

having read and fully understood this entire Operator's Manual and the engine manufacturer's manual, start the engine using the following procedures:

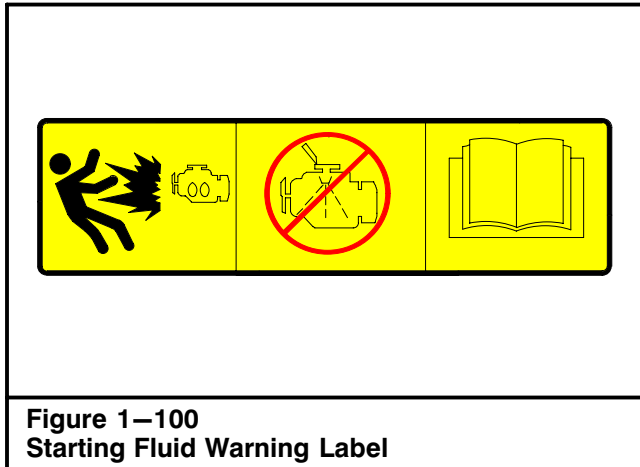


WARNING

Diesel exhaust fumes can be harmful. Start and operate engine in a well ventilated area. If it is necessary to operate in an enclosed area, vent the exhaust to the outside. Properly maintain the exhaust system to its original design.

1. Walk around the crane to verify that there are no persons under, or in close proximity to the crane.
2. Check the operator's cab to ensure that the transmission is in neutral and the travel park brake is engaged.
3. Sound the horn twice in succession, wait 10–15 seconds while making a visual check to verify that there are no persons under, or in close proximity to the crane.
4. In the operator's cab, turn the ignition switch to the “On” position to energize the engine electrical system and allow the gauges to go through their self-test routine.
5. If required, allow the Wait To Start indicator light to go out.
6. Turn the ignition switch to the “Start” position. Release the ignition switch when the engine starts. If the engine fails to start in 30 seconds, release the ignition switch and allow the starter motor to cool a few minutes before trying to start the engine again. If the engine fails to start after four attempts, refer to the engine manufacturer's manual for instructions.
7. Warm-Up — Run the engine at low throttle with no load while the engine is warming up. Observe the engine oil pressure gauge for proper indications. If there is no engine oil pressure after 10–15 seconds of running time, shutdown the engine immediately and repair the problem to avoid major engine damage. Refer to engine manufacturer's manual for proper oil pressure operating range.
8. When the engine has thoroughly warmed up, after all pressures and temperatures are within operating ranges, and all daily checks have been made, the crane is ready for operation.


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Engine Shutdown Procedure

1. Lower any load to the ground and secure it properly.
2. Engage the swing park brake or travel swing lock as required.
3. Throttle the engine back to idle.
4. Allow the engine to idle 3 to 5 minutes to allow the engine to cool gradually and uniformly.
5. Turn the ignition switch to the “Off” position.
6. Remove the ignition keys from the operator’s cab and lock the door if the crane is to be left unattended.

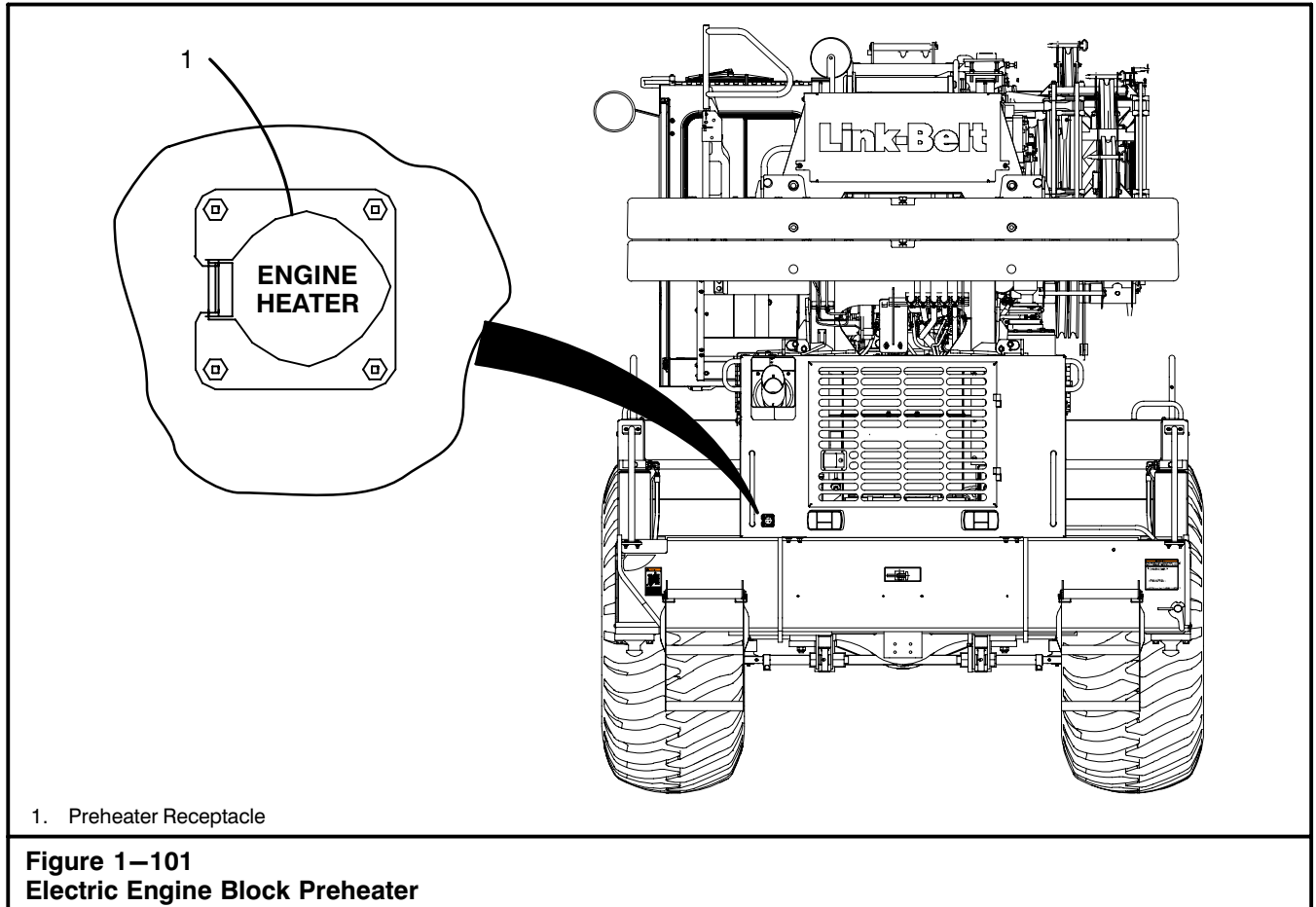
Cold Engine Starting

To help ignition in cold ambient conditions, an air intake heater is used to warm the intake air prior to starting the engine. This improves combustion efficiency which aids in starting a cold engine. With the ignition switch in the on position, the ECM senses ambient air temperature then determines if the air intake must be energized to warm the intake air. A “Wait To Start” indicator light  on the Crane Control Display will illuminate to alert the operator not to crank the engine because the combustion chamber is too cold for fuel ignition. When the cylinders are warm enough to ignite the first charges of fuel, the indicator light will go out and the engine can be started.



DANGER

Do not use starting fluids to aid in engine start up. This engine is equipped with a glow plug type cold starting aid and use of a starting fluid can cause an explosion resulting in serious personal injury or death.



1. Preheater Receptacle

Figure 1–101
Electric Engine Block Preheater

Electric Engine Block Preheater

The electric engine block preheater uses electrical power to heat the coolant and circulate it through the engine. The electric engine block preheater receptacle is on the rear of the carrier. Refer to Figure 1–101.

To Start The Electric Engine Block Preheater

1. Park crane in suitable area for storage, engage the travel park brake, position the transmission shifter to neutral, and shutdown the engine.



WARNING

Areas adjacent to the preheater must be clean and free of oil and debris to avoid possible fire hazard.

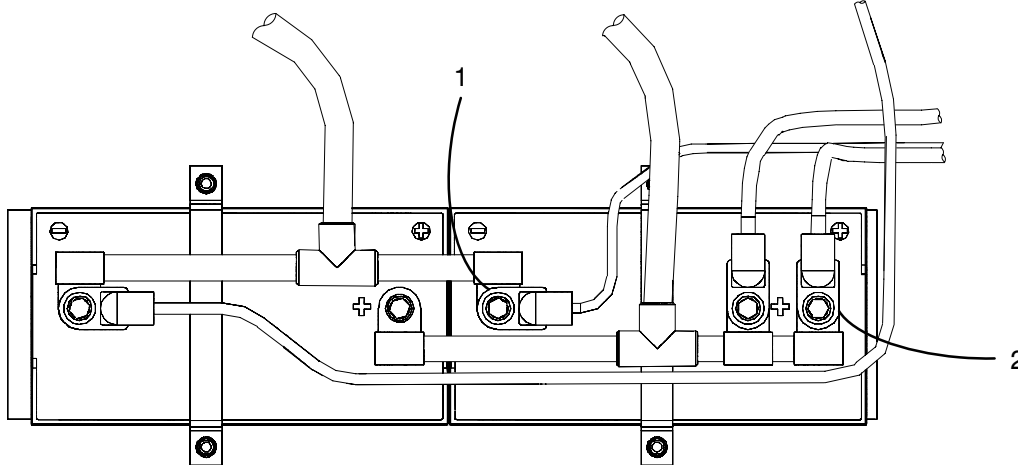
2. Plug an approved extension cord into the receptacle on the rear of the carrier. Plug the other end of the cord into a 110V to 120V electrical source.

Note: Unplug the electric engine block preheater before starting the engine.

To Stop Electric Engine Block Preheater

1. Unplug the extension cord from the electrical source and the preheater receptacle on the rear of the carrier.
2. Properly store the extension cord.

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- 1. Negative Terminal
- 2. Positive Terminal

Figure 1–102
Battery Cable Connections

Jump Starting The Crane

The crane has two (2) 12V batteries in the battery box at the rear of the crane.



WARNING

To avoid serious personal injury and/or major equipment damage, follow these procedures in the order they are given.



WARNING

Battery posts, terminals, and related accessories contain lead and lead compounds. Wash hands after handling.

Wear protective clothing and shield your face and eyes when working around batteries. Batteries contain sulfuric acid which burns skin, eyes, and clothing.

Do not jump start a damaged battery. Ensure vent caps are tight and level. If another vehicle is used, ensure booster vehicle and crane are not touching.

The gases around the battery can explode if exposed to open flames or sparks. An explosion could result in serious personal injury and/or major equipment damage.

1. Check all battery terminals and remove any corrosion before attaching jumper cables.
2. Connect one end of the first jumper cable to the 12V positive (+) terminal of the discharged battery.
3. Connect the other end of the first cable to the 12V positive (+) terminal of the 12V power source or booster battery.
4. Connect one end of the second jumper cable to the negative (–) terminal of the 12V power source or booster battery.
5. Connect the other end of the second cable to a ground location on the carrier frame as far away from crane batteries as possible.
6. If another vehicle is used to jump start the crane, start the booster vehicle. Ensure booster vehicle and crane are not touching. Run the booster vehicle's engine at a moderate speed.
7. Start the disabled crane. After the crane is started, remove jumper cables in reverse order.
8. Let the crane's engine run for a few minutes to charge the discharged batteries.
9. Check the battery gauge in the operator's cab. The gauge reading should be increasing toward 14 volts.

Note: If the batteries are at very low charge, voltage may increase slowly. If voltage does not increase, replace the batteries and/or check the electrical system.

Crane Operation

Cranes are used primarily for making heavy lifts. In order to do this properly, certain procedures must be followed. The following is a suggested procedure for making typical lifts:

Note: Before operating the crane near airports, radio and microwave towers, power lines, etc., always refer to and comply with all local, state, and federal laws.

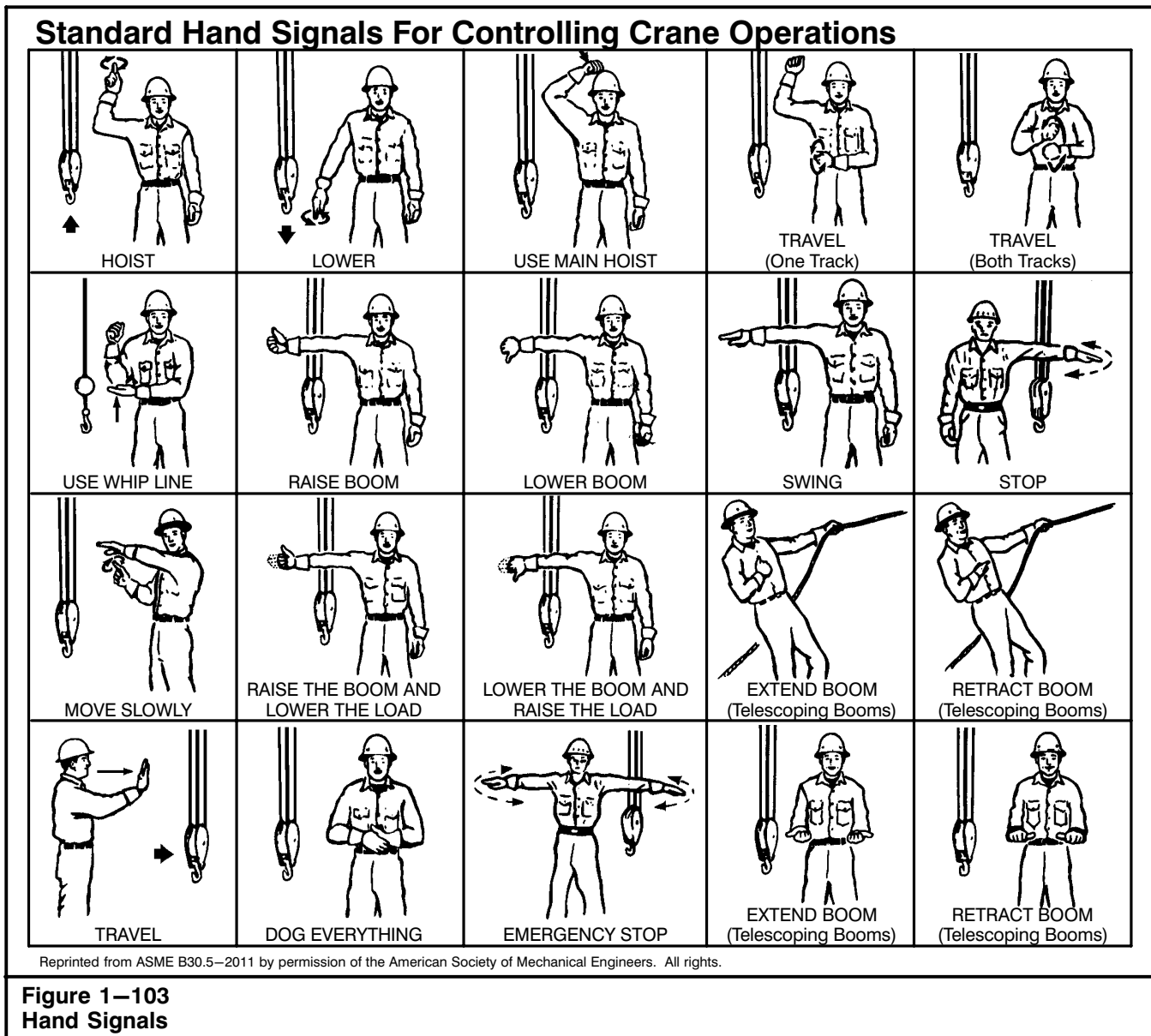
1. Determine the weight to be lifted. Add the weight of the hook block and/or hook ball, slings, rigging, fly, etc. Determine height to which the load must be lifted.
2. Refer to the capacity chart, Working Areas and Working Range Charts in the Crane Rating Manual in the operator's cab. Find the shortest boom length and load radius that will accomplish the job.
3. Position the crane so a minimum swing is necessary. Do not swing the upper over areas not covered on the capacity chart in the Crane Rating Manual, as the crane could tip, even without a load on the hook in these areas.
4. The crane must be supported by a firm, level surface before starting to lift. All capacities in the Crane Rating Manual are based on the crane being level in all directions. If the crane is not level, out swing or side swing of the load will greatly reduce lifting capacities and could cause a serious accident or major crane damage. If the ground is soft, use mats.
5. If outriggers are used, the following points must be observed:
 - a. The outrigger beams must all be equally extended (all fully retracted, intermediate extended, or fully extended) to lift the loads shown in the Crane Rating Manual. Major reductions in lifting capacity will result if beams are not in the same position and this could lead to a serious accident or major crane damage.
 - b. Outrigger pontoons must be on solid, smooth footing, flush with the ground (no hills, or valleys under pontoons), otherwise pontoons may be damaged or destroyed. If there is any doubt, use mats.
 - c. All capacities listed for the crane on outriggers are based on the outrigger jacks being used to raise the crane so that all tires are clear of the ground and the crane is level. A bubble level is provided in the operator's cab to assist the operator in leveling the crane.
6. When making lifts on tires, the following points must be observed:
 - a. All tires must be inflated to pressures as listed on the Tire Inflation Label on the hydraulic reservoir or in the Crane Rating Manual.
 - b. On tire lifts are to be made from the main boom only. Do not use the auxiliary lifting sheave or fly.
 - c. Lifts while on tires must be made with the crane on a firm level surface. Use mats and/or grade the supporting surface as required to ensure safe lift.
7. Raise the boom and swing over the load. Extend the boom to the desired length.
8. Lower the hook block and/or hook ball and fasten it onto the load. The following points must be observed:
 - a. The boom peak must be directly above the load. Booms are made to lift, and must never be used to drag a load sideways.
 - b. Always use chains, wire ropes, or slings of ample size and make periodic checks of their condition.
 - c. Always use sufficient parts of line. Refer to Wire Rope Capacity Chart in the Crane Rating Manual in the operator's cab for the number of parts of line needed for a given lift.
 - d. When lifting loads, care should be taken to prevent sudden loading or unloading of the winch wire rope. Ease into the load. Lift the load a few inches (*centimeters*) off the ground and hold to check the winch brakes.
9. Lift the load to the desired height. Boom to the desired angle. Use care when booming down or extending the boom, as these increase the load radius and result in a decrease in capacity. Ensure the load being lifted remains within the lifting capacity of the crane at the boom length and radius being used.
10. Control the load at all times. Use hand lines to guide the load. Do not guide loads into place with your hands. Swing slowly and smoothly. Avoid jerks when starting or stopping swings.
11. If the crane is to travel with a suspended load, refer to "Pick And Carry Operation" in this Section of this Operator's Manual for further instructions.

During Operation

The operator must remain alert to possible malfunctioning of the crane while operating. If the crane does malfunction, lower the load and shutdown the crane until the problem is found and corrected. During operation, the operator must:

1. Remain alert to any noise, loss of power, or bad response to control of the crane. Watch the engine oil pressure and coolant temperature gauges for proper operating ranges.

Operator's Manual



2. Watch the hydraulic system oil temperature gauge. If the temperature exceeds maximum temperature, shutdown the crane until the problem is corrected. (Refer to Section 2 of this Operator's Manual for the maximum temperature for each viscosity of hydraulic oil.)
3. Listen for any unusual noises in the hydraulic system, power train, gear boxes, etc. If any, correct problem.
4. Watch for oil leaks or any loss of control. If any develop, correct before continuing operation.
5. Ensure all controls work freely and easily, with no sticking or binding. Lubricate or adjust as necessary.
6. If working on outriggers, periodically check the outriggers to ensure the crane is level and stable. If working on tires, ensure the tires are inflated to the proper pressure. (Refer to the Tire Inflation Label or the Crane Rating Manual for proper tire pressure.)
7. Heed all DANGER, WARNING, and CAUTION labels. Observe good safety practices at all times.

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Hand Signals

Hand Signals are important for communications between the designated signal person and the operator. A Hand Signal Chart, Figure 1–103, is included in this Section of this Operator's Manual. A copy is also on the right side window in the operator's cab.

These signals should be used at all times unless voice instructions with a radio or telephone are being used. One person should be designated as a signal person and their signals obeyed by the operator. Obey a stop signal from anyone.

Pick And Carry Operation

Travel during pick and carry operations is restricted to speeds of 2.5 mph (4km/h) or less, and creep, on a firm, level surface. Creep is defined as crane movement limited to 200 ft (61m) in a 30 minute period and not to exceed 1mph (1.6km/h) maximum speed. Lifts are to be made off the main boom only, with the crane prepared as follows:

1. Ensure that the suspension has been adjusted to the proper travel height. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.
2. Inflate the tires to the required pressure listed on the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual.
3. Do not exceed On Tires, Pick And Carry capacities. Refer to Creep or 2.5 mph (4km/h) capacity charts in the Crane Rating Manual.
4. Level the crane on fully extended outriggers with the tires clear of the ground.

5. Position upper over front of the carrier and engage the travel swing lock. Release the swing park brake and the 360° swing lock if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during pick and carry operations. Failure to release these devices during this operation may result in damage to the swing mechanism.

6. Boom must be extended in accordance with "STD" or "A-Max" boom modes.
7. Properly store the fly base and tip, if equipped.
8. Retract all outrigger jacks just clear of the ground but leave the outrigger beams fully extended.
9. Attach as many hand lines as necessary to prevent the load from swinging during travel.
10. Carefully attach the load to the winch wire rope and lift it only as high as necessary.
11. Carefully travel at no more than 2.5 mph (4km/h) depending on chart selection. Take extra care due to the increased overall width caused by the extended outrigger beams. The outriggers or pontoons must not be allowed to hit any obstructions. Maintain a safe distance from all personnel and obstructions. Travel only on a firm, level surface.
12. Once the desired destination is reached, shift the transmission to neutral and apply the travel park brake.

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Job Site Travel, No Load Upper Over The Front, Boom Retracted 2.5 MPH (4.0km/h) Maximum

Counterweight lb (kg) Installed on Upper	Minimum – Maximum Boom Angle (°)			
	38–64 Ft (11.6–19.5m) Fly Stored	38 Ft (11.6m) Fly Erected (2° Offset)	64 Ft (19.5m) Fly Erected (2° Offset)	80–96 Ft (24.4–29.3m) Fly Erected (2° Offset)
0 (0)	0–45	0–45	0–45	PROHIBITED
9,600 (4 354)	0–45	0–45	0–45	PROHIBITED
19,200 (8 709)	0–45	0–45	0–45	25–45

Traveling The Crane

Certain conditions must be met for safe travel. Refer to the following procedures before traveling the crane.



WARNING

Do not use 4-Wheel, crab, or rear wheel steer mode for extended or high speed travel as steering behavior may be unfamiliar and a loss of crane control could occur.

Do not travel with upper over the side. Position upper over the front and engage the travel swing lock. Crane may tip over causing serious personal injury and/or major crane damage.

Job Site Travel

Job site travel is limited to speeds less than 2.5 mph (4km/h). The crane may be traveled on the job site with no load per the following procedure:

1. Ensure that the suspension has been adjusted to the proper travel height. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.
2. Inflate the tires to pressure listed on the Tire Inflation Label or the Tire Inflation Chart in Crane Rating Manual for 2.5 mph (4km/h) maximum speed.
3. Level the crane on fully extended outriggers.
4. If traveling on a firm, smooth, and level surface, position the upper and attachments according to the "Job Site Travel" Chart in this Section of this Operator's Manual. Do not move the boom during travel.

5. If traveling on a slope, travel directly up or down the slope. Position the upper over the front of the carrier with the boom fully retracted and at 0°. The fly base and tip must be stored.
6. Engage the travel swing lock. Release the swing park brake and the 360° swing lock if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during pick and carry operations. Failure to release these devices during this operation may result in damage to the swing mechanism.

7. Fully retract all outrigger jacks and beams.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

8. Secure hook block and/or hook ball to prevent excessive swinging.
9. Carefully travel at no more than 2.5 mph (4km/h). Maintain a safe distance from all obstructions, structures, and power lines.
10. Once the desired destination is reached, shift the transmission to neutral and apply the travel park brake.

Highway Travel

Highway, or high speed travel is considered to be any travel of the crane over 2.5 mph (4km/h). The following conditions and precautions must be met for any highway or high speed travel.

1. If equipped, the fly base and tip must be secured in the stored position on the boom.
2. Retract the cab walk to its stored position.
3. Position the upper guard rails in the Stored/Travel position.
4. The boom must be over the front of the crane with the travel swing lock engaged. Release the swing park brake and the 360° swing lock if equipped.

CAUTION

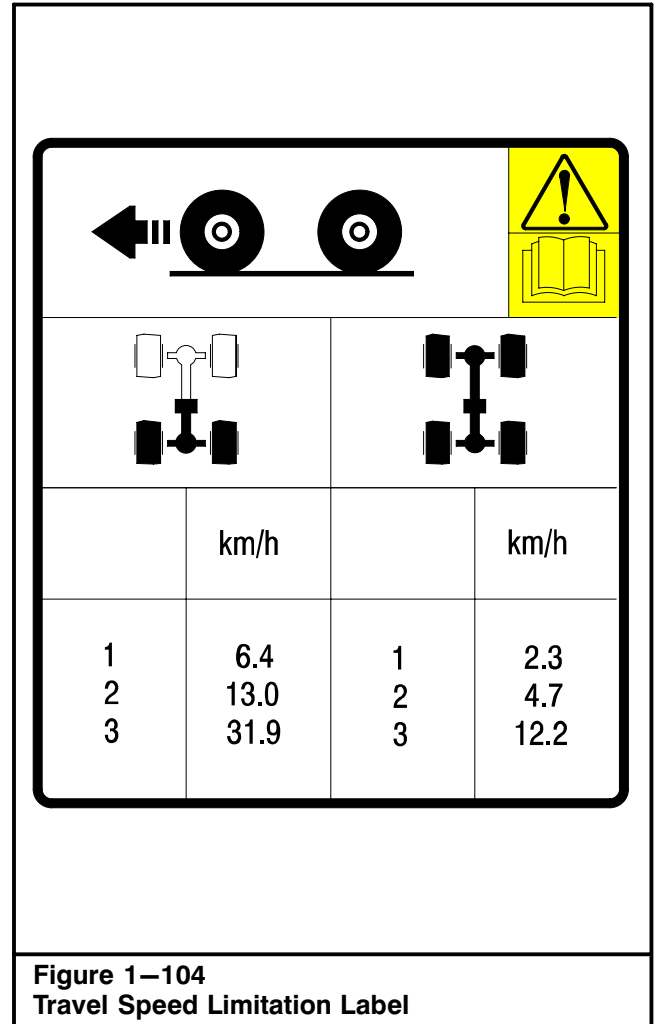
Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during highway or high speed travel. Failure to release these devices during these operations may result in damage to the swing mechanism.

5. All boom sections must be fully retracted with the boom at 0°. Secure the hook block and/or hook ball to prevent excessive swinging.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

6. All outriggers must be fully retracted (jacks and beams) with all pontoons removed from jacks and stored properly.
7. The drive train must be set to 2-Wheel drive and the steering selection switch in the Conventional Steer mode.
8. Disengage the main hydraulic pump if equipped.
9. Ensure that the suspension has been adjusted to the proper travel height. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.



10. Check all tires for correct pressure, adjust if required. Refer to the Tire Inflation Label on the hydraulic reservoir or Tire Inflation Chart in the Crane Rating Manual.
11. During highway travel there must be at least a 30 minute rest period for every 50 miles (80km) of driving or 2 hours of sustained operation whichever occurs first and a 60 minute rest period after 4 hours of operation.
12. Obey all "Rules of the Road" and travel carefully.

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Counterweight Removal And Installation (If Equipped)

Access to certain job sites may require the crane to be transported on roads with strict vehicle load limitations. In order to meet such limitations, the counterweight can be removed and transported separately. If the crane is equipped with maximum counterweight, removing the counterweight can reduce the weight of the crane by as much as 19,200 (8 709).



WARNING

When operating the crane with no counterweight, always refer to the Crane Rating Manual to ensure lifting capacities are not exceeded.

Counterweight Removal

1. Park the crane on a firm level surface, engage the travel park brake, and shift the transmission to neutral.
2. Properly level the crane on fully extended outriggers with all tires clear of the ground.
3. Fully retract all boom sections. If equipped, properly store the fly on the boom.
4. Swing the upper over the front of the carrier. Engage the travel swing lock and boom up to 63°.
5. Attach the remote control box to the electrical connector on the left rear of the upper frame. Refer to Figure 1–105.

Note: If only one counterweight slab is installed on the upper, place the single counterweight removal brackets in the “Up” position.



WARNING

To avoid personal injury, do not place any body part under counterweight during lowering or raising of the counterweights.

6. Remove the keepers and pins which secure the counterweight to the upper frame.

Note: Counterweight cylinders may have to be raised (retracted) to relieve pressure on the pins to ease removal.

CAUTION

Do not fully extend the counterweight removal cylinders allowing them to push down on the counterweights. Damage to the engine hood may occur. Extend the cylinder just enough to allow the counterweights to rest on the removal brackets.

7. Push the DOWN button on the remote control box to lower (extend) the counterweight to the counterweight removal brackets.
8. Remove the lock pins and counterweight connecting pins which secure the counterweight to the counterweight removal cylinders.

Note: If all counterweights are not to be removed, remove only the two counterweight connecting pins above the counterweight(s) to be removed.

9. Push the UP button on the remote control box to raise (retract) the cylinders away from the counterweight.

Note: The counterweight slabs weigh 9,600 lb (4 354kg) each.

10. Swing the upper over the rear of the carrier. Attach a sling to the counterweight using the lifting bars in the counterweight.
11. Attach the other end of the sling to the hook block.

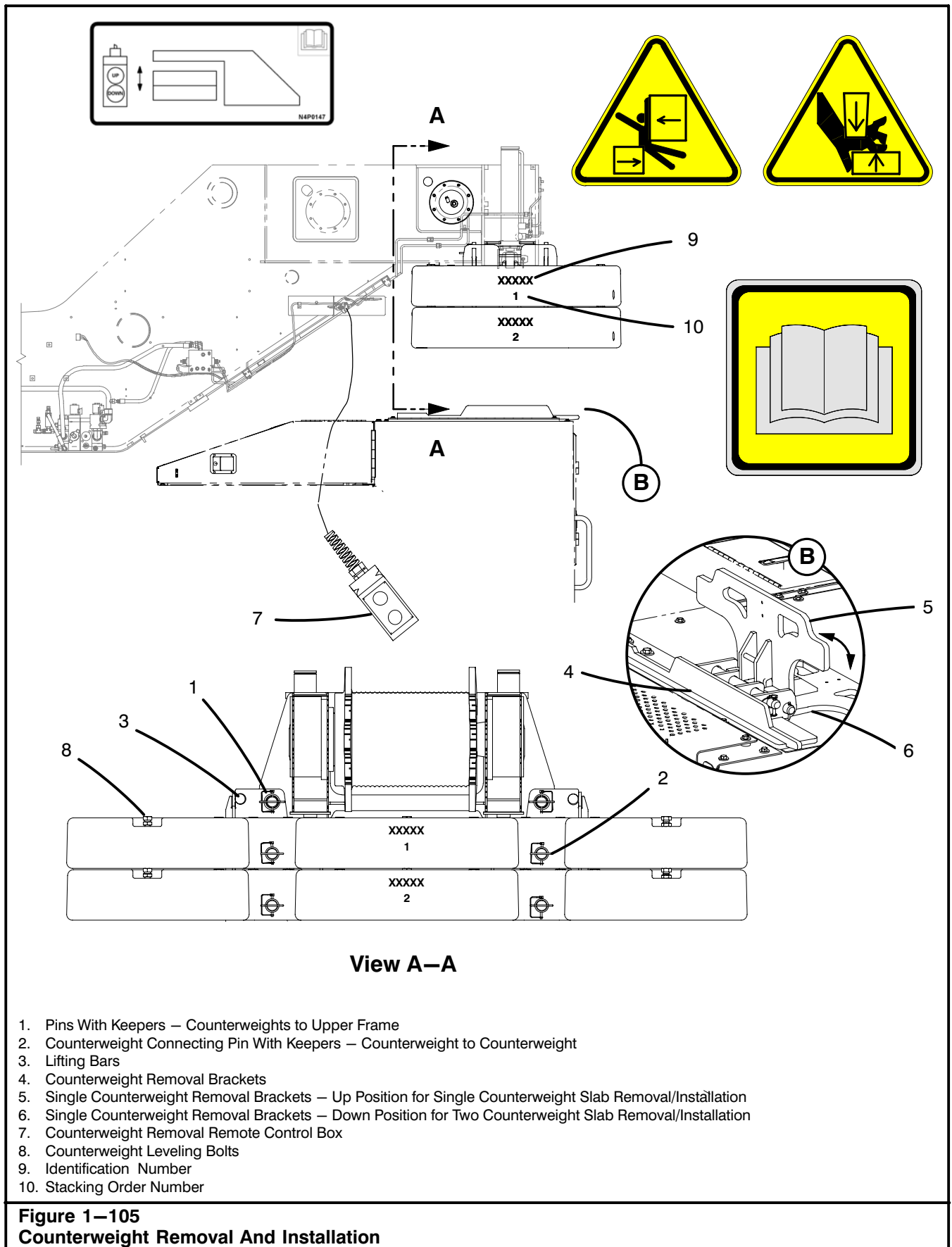


WARNING

When operating the crane with no counterweight, always refer to the Crane Rating Manual to ensure lifting capacities are not exceeded.

Do not travel or transport the crane with the counterweight positioned on the removal brackets. Counterweight may fall causing serious personal injury and/or major crane damage.

12. Lift counterweight off removal brackets and onto a transport vehicle.



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Counterweight Installation

1. Park the crane on a firm level surface, engage the travel park brake, and shift the transmission to neutral.
2. Properly level the crane on fully extended outriggers with all tires clear of the ground.

Note: The counterweights are stamped with an identification number and stacking order number as illustrated in Figure 1–105. When installing counterweights, ensure the counterweights are stacked in sequential order from the top down beginning with “1”.

3. Attach a sling to the counterweight using the lifting bars on the counterweight. Refer to Figure 1–105.

Note: If only one counterweight slab is to be installed on the upper, place the single counterweight removal brackets in the “Up” position. If two slabs are to be installed, ensure the brackets are in the “Down” position.

Note: The counterweight slabs weigh 9,600 lb (4 354kg) each.

4. Using the crane, pick the counterweight off the transport vehicle.



WARNING

When operating the crane with no counterweight, always refer to the Crane Rating Manual to ensure lifting capacities are not exceeded.

5. Swing the upper over the rear of the carrier. Engage the travel swing lock. Set the counterweight on the removal brackets. Ensure counterweight is balanced on the removal brackets.



WARNING

Counterweight must be balanced on the removal brackets. Counterweight may fall causing serious personal injury and/or major crane damage.

6. Swing the upper over the front of the carrier and engage the travel swing lock.

CAUTION

Do not fully extend the counterweight removal cylinders allowing them to push down on the counterweights. Damage to the engine hood may occur. Extend the cylinder just enough to align with the counterweights connecting lugs.

7. Push the DOWN button on the remote control box to lower (extend) the counterweight removal cylinders to align connecting lugs on the counterweight.
8. Install the counterweight connecting pins and lock pins to secure the counterweight to the counterweight removal cylinders.



WARNING

To avoid personal injury, do not place any body part under counterweight during lowering or raising of the counterweights.

9. Push the UP button on the remote control box to raise (retract) the cylinders and lift the counterweight.
10. Continue to lift counterweight until the lugs on the counterweight align with the lugs on the upper frame.
11. Install the pins and keepers which secure the counterweight to the upper frame.
12. Lower (extend) cylinders slightly to transfer the weight of the counterweight from the cylinders to the upper frame.
13. Adjust the counterweight leveling bolts so that the counterweights hang level and do not sway. Do not tighten the leveling bolt to the point that the counterweight pins cannot be easily removed.

Lifting The Crane

The entire crane (except the fly) can be lifted or the components may be removed from the crane and lifted individually. Refer to Figure 1–106 for the center of gravity (CG) and weights for the entire crane and the individual components. The following conditions and precautions must be met before lifting the crane or removing any component.

1. The crane must be parked on a firm level surface with the boom fully retracted at 0° and the travel swing lock engaged. The swing park brake and 360° swing lock, if equipped, must be released.
2. Use lifting equipment, shackles, slings, chains, etc. of suitable size and strength. All lifting equipment must be inspected before lifting the crane. The inspection must be recorded and dated in accordance with current OSHA regulations.

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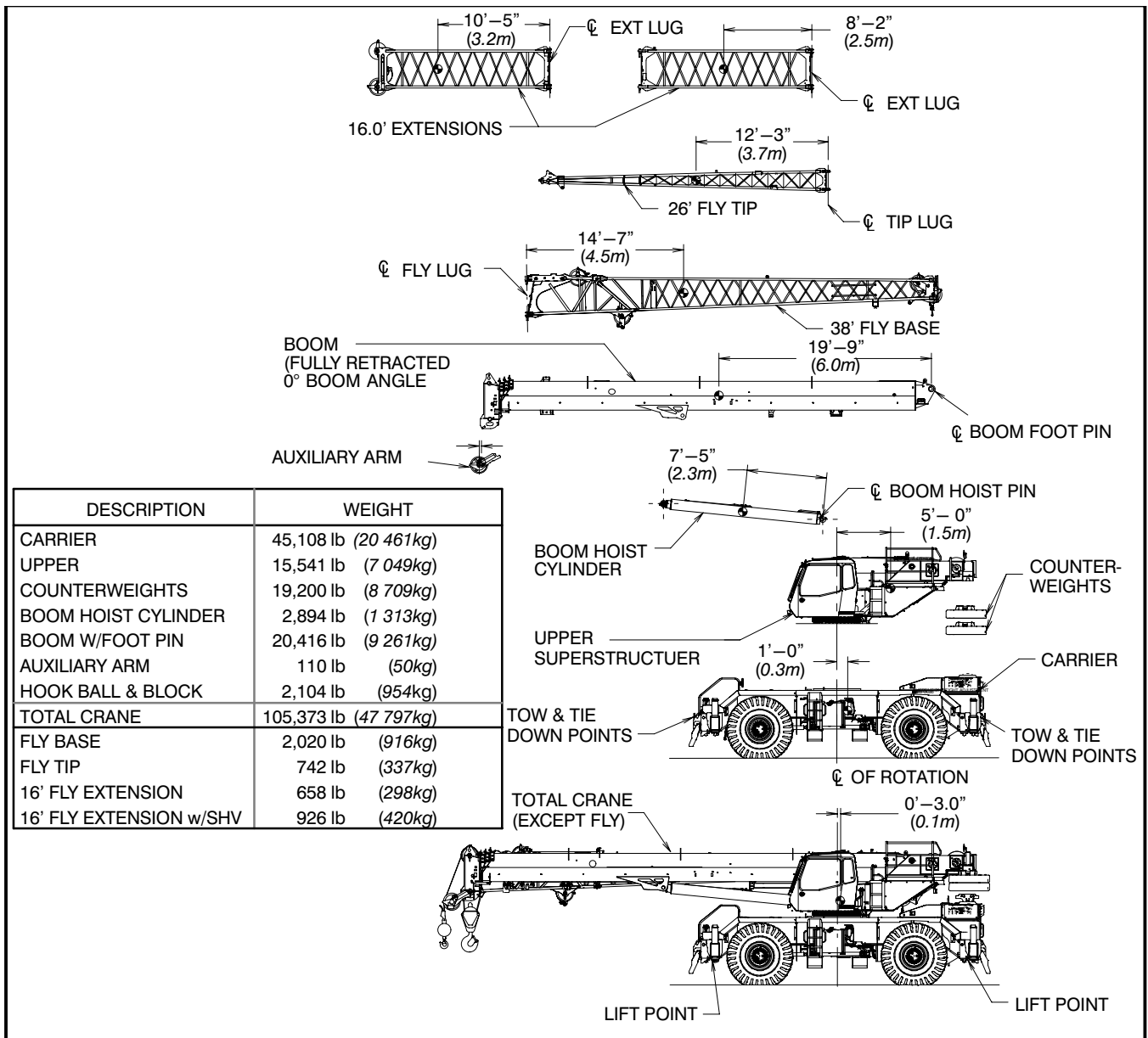


Figure 1-106
Lifting The Crane

- Do not lift the crane with the fly attached to the boom. Damage to the fly may result. Remove the fly from the crane before lifting. Refer to Section 4 of this Operator's Manual for the correct procedures for removing the fly.
- When lifting the entire crane (without fly), extend the outrigger beams to the intermediate position and install slings around the beams. Protect slings from any sharp edges.
- Retract the cab walk to its stored position.
- Position the upper guard rails in the Stored/Travel position.
- The weights and locations of all CG's include all possible options (heaviest crane) except the fly

base and fly tip. Use the CG's as a starting point. Center hoist line on the CG, lift a few inches (*centimeters*) and adjust the hoist line to keep the crane/component(s) level at all times.

- Removal of any component(s) from the crane will shift the CG of the entire crane. Adjust hoist line to account for the removal of any component(s).
- Use only properly attached nylon straps to lift fly base or fly tip to prevent damage to the component. Refer to Figure 1-13. Protect the straps from sharp edges.
- Do not allow the hoist lines to contact boom while lifting crane. Damage to the boom may result.

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Towing The Crane

Always use good judgment and reliable equipment when towing the crane. Use extra caution when towing the crane on the highway and in traffic. When making connections between the crane and towing vehicle, ensure none of the connections will cause damage to either vehicle. Pay particular attention to tie rods, brake lines, power steering cylinders, and power steering lines. The tow lugs are the recommended connection points on the crane.

Note: Due to difficulty in steering the crane, towing should be limited to short distances.

Always exercise safety and follow all local codes when towing the crane. Prepare the crane as follows before towing it.

1. If equipped, store the fly base and tip on the boom.
2. The boom must be over the front of the crane with the travel swing lock engaged. Release the swing park brake and the 360° swing lock if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during towing operations. Failure to release these devices during this operation may result in damage to the swing mechanism.

3. The boom must be fully retracted with at a 0° angle. Secure the hook block and/or hook ball to prevent excessive swinging.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

4. All outriggers must be fully retracted (jacks and beams) with all pontoons removed from jacks and properly stored.
5. All control levers in the operator's cab must be in the neutral position.
6. Shift the transmission to neutral and engage the 2-Wheel Drive mode. Remove the drive tube between the transmission and axle or lift the rear driving wheels.

CAUTION

Failure to disconnect the drive tube, or lift the driving wheels, before pushing or towing the crane can cause major transmission damage.

7. Unlock the steering column by turning the ignition switch to the "On" position. Turn on the hazard flashers.
8. Release the travel park brake when the crane is attached to the towing vehicle and ready to be towed.

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Transporting The Crane

When transporting the crane, precautions should be taken in securing the crane to the trailer, barge, or other means of conveyance. The tow lugs are the recommended tie down points. If the tow lugs cannot be used to tie the crane down, chains may be looped around the outrigger boxes or the axle housings to secure the crane down.

CAUTION

If chains are wrapped around the axle housing, be certain the chains will not damage the tie rods, brake lines, power steering cylinders, or power steering lines.

If chains are wrapped around the outrigger box collar, be certain the chains will not damage the hydraulic lines and fittings. The chains should be wrapped around the outrigger box, not the outrigger beam.

Always exercise safety and follow all local codes when loading, unloading, or transporting the crane.

Prepare the crane as follows before transporting it:

1. If equipped, store the fly base and tip on boom.
2. The boom must be over the front of the carrier with the travel swing lock engaged. Release the swing park brake and 360° swing lock if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position while transporting the crane. Failure to release these devices during this operation may result in damage to the swing mechanism.

3. The boom must be fully retracted and at a 0° angle. Secure the hook block and/or hook ball to prevent excessive swinging.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

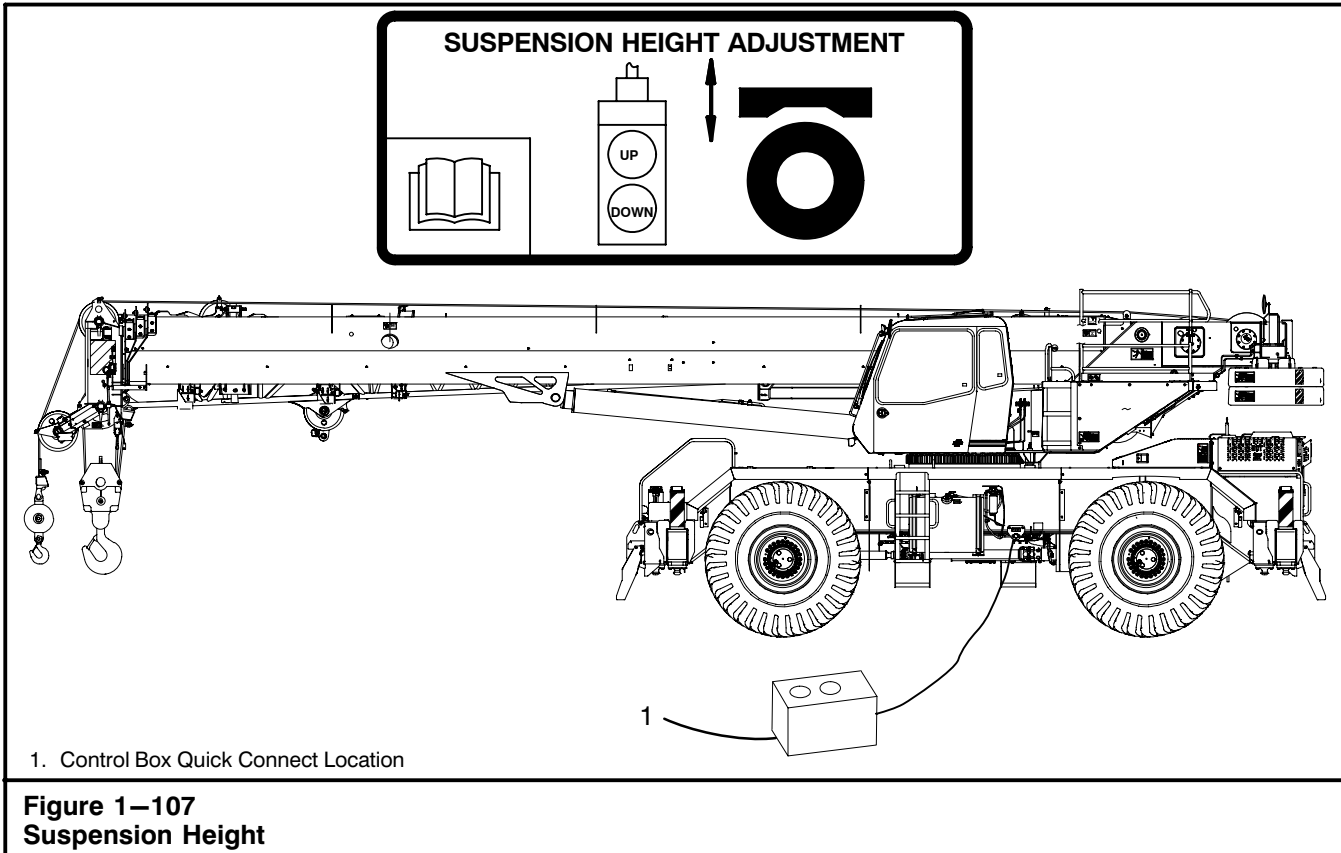
4. All outriggers must be fully retracted (jacks and beams) with all pontoons removed from jacks and stored properly.
5. Engage the travel park brake and shift the transmission to neutral.
6. If transport height adjustment is required, refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.
7. All control levers in the operator's cab must be in the neutral position.
8. Securely cover the exhaust to prevent air being forced into the exhaust. Covering the exhaust will also help prevent any water or other contamination from entering the exhaust which could also damage the turbocharger.

CAUTION

When a turbocharged engine is not running, air forced into the exhaust will cause the turbocharger impeller to spin. Without the engine running, the turbocharger bearing is not lubricated. When transporting the crane and the exhaust is facing in a direction such that the travel speed continually forces air into the exhaust, it may cause major damage to, or total destruction of the turbocharger.

9. Shutdown the engine and remove the keys from the crane. Lock all windows and doors.
10. Position the upper guard rails in the Stored/Travel position.
11. Retract the cab walk to its stored position.
12. Depending on the specific situations, further preparations may be needed to protect the crane from the environment or vandalism. Refer to "Crane Storage" for further suggestions.

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Suspension Height Adjustment

The oscillation suspension cylinders can be retracted to reduce the overall height of the crane during transport. A hand held electrical control box with 20 ft (6.1m) of cable is used to adjust the height of the crane. This is the same electrical control box as used on the counterweight removal option. A quick connect electrical connection is provided under the left fender.

Once the crane reaches the job site and is unloaded from the transport vehicle, the suspension must be properly adjusted to the correct travel height before operating the crane.

CAUTION

Do not travel the crane with the axle oscillation cylinders fully extended or fully retracted. Major damage to suspension components can occur if the crane's oscillation suspension is not properly adjusted. Oscillation cylinders which are not properly adjusted can leave suspension components unprotected from shock loads which can lead to major crane damage. Inspect the axle oscillation cylinders daily for the proper adjustment as required.

Use the following procedures to adjust the travel height.

1. Park the crane on a firm level surface.
2. Position the upper directly over the front of the carrier, fully retract the boom and lower to 0 degree angle, and engage the travel swing lock.
3. Measure the non-painted rod length for each oscillation cylinder. The sum of the exposed rods should equal 4.0 in \pm 0.125 in (10.16cm \pm 0.318cm). If suspension cylinders are not within specification proceed to the next Step.
4. With the crane on tires and on a firm level surface, push the UP button to extend the oscillation cylinders until the measured sum of the exposed rods equals 4.0 in (10.16cm).

Note: Do not retract suspension cylinders to obtain the measured sum of the exposed rods.

5. On cranes equipped with the Hydro-gas option, press the DOWN button and hold for approximately 30 seconds. Then press the UP button until the non-painted rod length equals 4.0 in \pm 0.125 in (10.16cm \pm 0.318cm).
6. For transporting the crane, the suspension may be fully lowered exposing 0 in (0 cm) of rod length. If equipped with Hydro-gas suspension, press the DOWN button and hold for approximately 30 seconds.
7. Disconnect the control box and store in the crane's tool box under the operator's seat.

Crane Storage

Anytime the crane is going to be left unattended it should be prepared so that it will not be damaged by the elements, be an attraction to vandals, or a plaything for children.

Short Term Storage

1. Do not leave crane where it will be a traffic hazard.
2. Lower all loads to the ground.
3. The travel swing lock must be engaged.
4. Fully retract the boom. Boom down to 0°. The fly may be erected if the crane is on outriggers.
5. Tie off the hook block and/or hook ball to the tow lugs. Winch lines should be snug.
6. All control levers must be in the neutral position.
7. Shift the transmission to neutral, engage the travel park brake, and shutdown the engine. Block the wheels to prevent the crane from rolling if on tires.
8. If the crane is on outriggers, the outriggers must be properly set and supported so the crane will remain level.
9. In cold weather, park the crane where it will not freeze to the ground.
10. To preserve battery life, move the battery disconnect switches to the off position.
11. Remove the keys from the crane. Lock all windows and doors.

Long Term Storage

1. Store the crane inside a building if possible.
2. Thoroughly clean the crane.
3. Touch up any spots where paint has chipped. This will prevent rusting.
4. Lubricate the entire crane as per the Lubrication Chart. Ensure all gear cases are filled to their proper oil level.
5. Inflate tires to proper pressure as shown on the Tire Inflation Label or in the Crane Rating Manual. Check tire pressures periodically during storage to

ensure they do not go flat. If possible block the crane up so the tires are clear of the ground. Ensure the blocking is placed so the crane cannot fall off it. If this is not possible, set the crane on planks so the tires will not sink in the ground. Block the tires to prevent the crane from rolling.

6. Fully retract all hydraulic cylinders if possible. Fully retract the boom and store the fly, if equipped. Cover all cylinder rods, machined, and unpainted surfaces with a coat of grease.
7. Position all control levers in neutral.
8. Engage the travel park brake, shift the transmission to neutral, and shutdown the engine.
9. Prepare the engine as per the engine manufacturer's manual. Ensure antifreeze protection is sufficient to prevent the engine from freezing.
10. After engine has cooled, cover all open areas around engine, operator's cab, etc. to prevent entry of water. Cover entire engine area with a tarp if possible.
11. To preserve battery life, move the battery disconnect switches to the off position.
12. Remove the keys and lock the operator's cab doors if in a location where vandalism may occur. Cover all operator's cab glass with plywood or boards to prevent glass breakage. Provide a means of locking the engine access doors, fuel tank, and hydraulic reservoir.
13. Store the crane so it does not provide a plaything for children. Such a unit can be an "attractive nuisance" for children to play on. If they fall off it or get entangled, serious injury may result.
14. While in storage, crane should be "exercised" every 60 days to ensure the working condition of the crane. Remove necessary tarps, start engine, and operate all switches, control cables, and hydraulic functions several times to circulate lubricants and to keep all mechanisms and linkages operative.

Operator's Manual